NOVEMBER, 1944

VOLUME 35 • NUMBER 5

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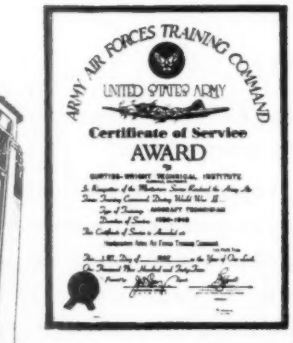

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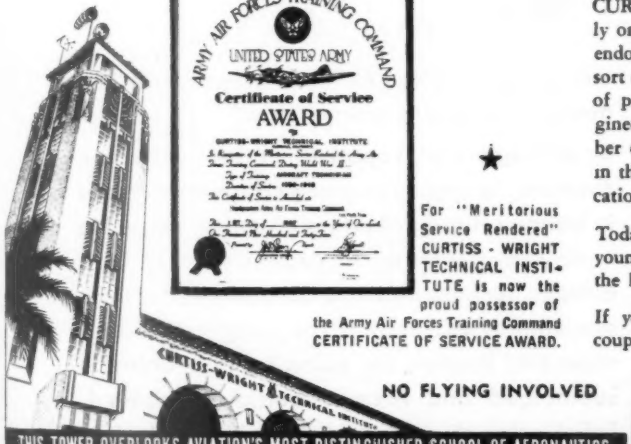

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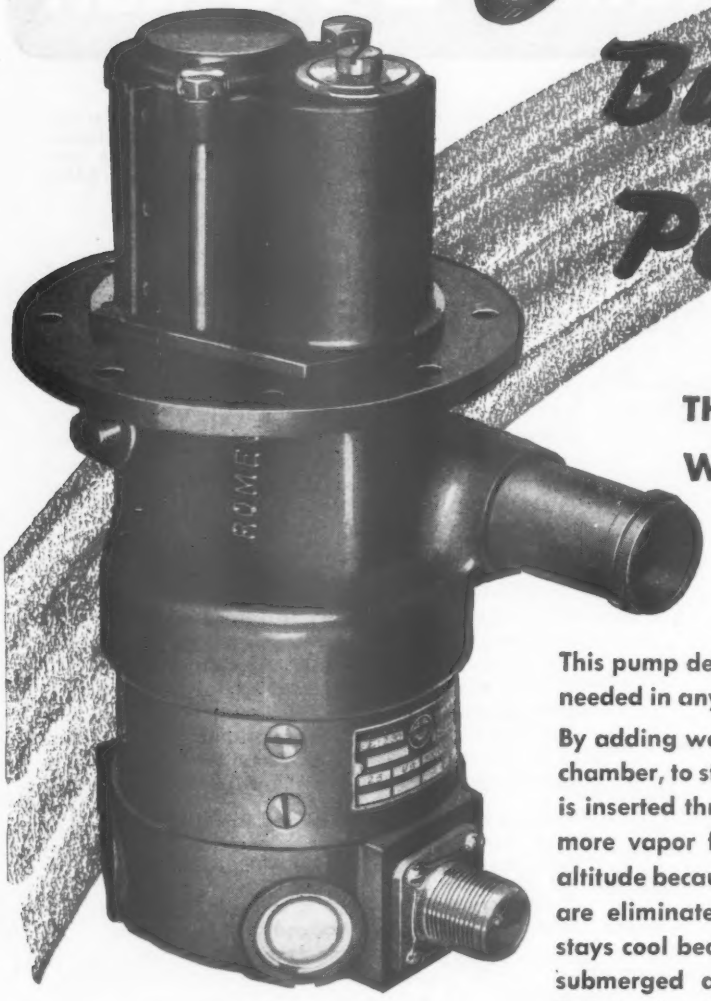

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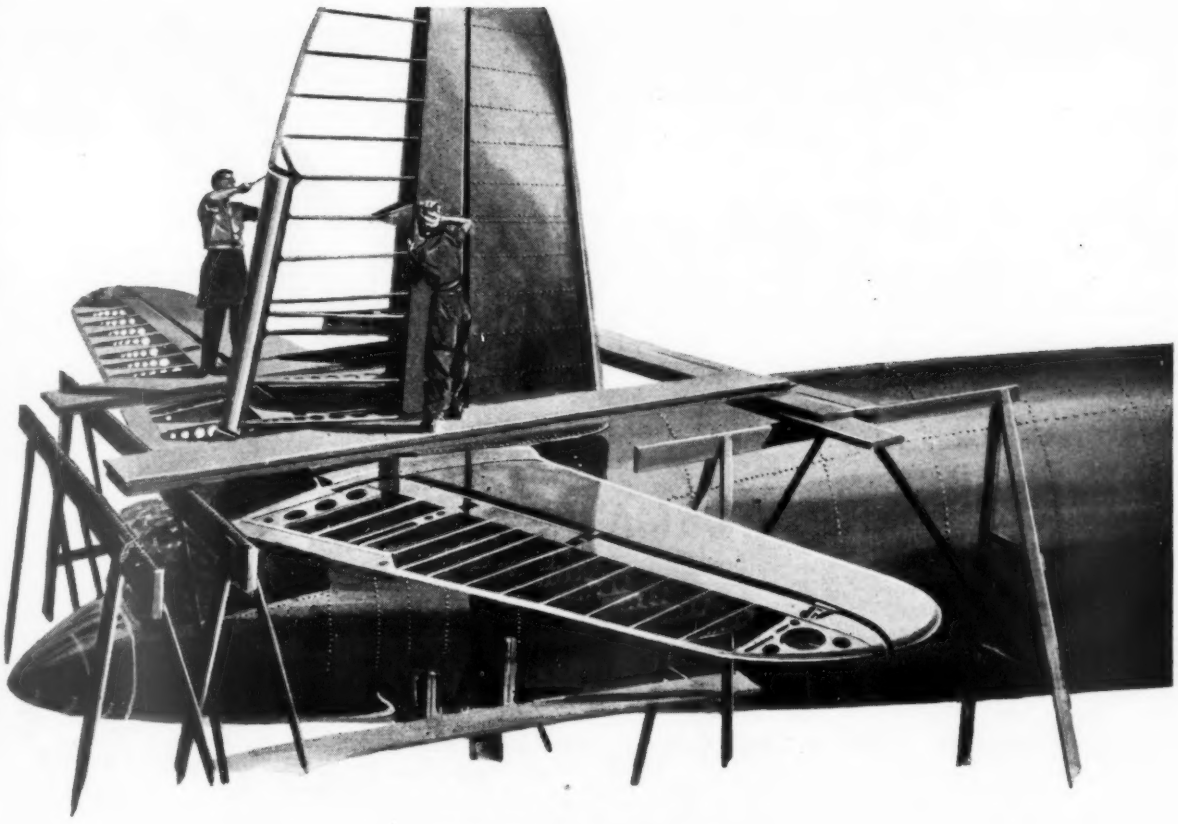

CRAFTSMEN IN AIRCRAFT PRODUCTION

WITH more than 30 years' experience in aircraft design and construction, engineers at Goodyear Aircraft Corporation have been asked to tackle some of the toughest war production assignments, including empennage and wing design and construction. That this company has succeeded in turning out components for 14 warplanes plus complete Navy airships and Corsairs speaks well for the craftsmanship of Goodyear—a great name in aircraft. Goodyear Aircraft Corporation, Akron, Ohio.

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A GREAT NAME IN AIRCRAFT

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Pan American Airways photo

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In their far-flung operations across the face of the globe Pan American World Airways System has been a true pioneer and a model of efficiency. The record of dependable service they have compiled is unique in air transportation. Dependability is the one outstanding characteristic of Champion Spark Plugs, and Champion is indeed proud of the part its product is playing in Pan American ships. Champion Ceramic Aircraft Spark Plugs are approved by the Atlantic and Pacific Division of Pan American and are on active duty daily throughout their vast network of routes. Champion Spark Plug Company, Toledo 1, Ohio.

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HELICOPTER INSTRUMENTS are called upon to indicate performance of a nature different from that generally associated with the operation of conventional airplanes. Kollsman has already devised a special dual tachometer and synchroscope for experimental helicopter work. A super-sensitive air speed indicator is also called for, because of the helicopter's ability to move at low lateral speeds. The ship's ability to hover and to make slow descents also suggests refinements in rate-of-climb indicators. Whatever the ultimate instrument requirements of the helicopter, Kollsman engineers will be ready with practical and efficient designs, keeping pace, as always, with every advancement in the science and the art of operation.

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It pays to be adaptable!

After the war, Crown Zipper engineers will adapt—or if necessary, *create*—special applications to meet special needs!

A lot of old-fashioned notions were exploded when Crown Zipper engineers went into the field with our armed forces to adapt zippers to military jobs.

Crown engineers proved that zippers can be big and tough yet easy to operate, small and dainty yet virtually indestructible!

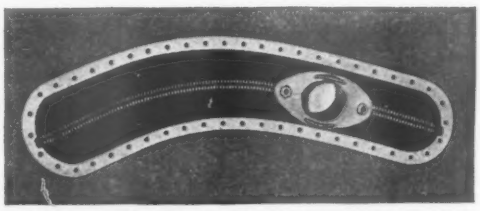
They proved zippers can be made that actually slide freely around sharpest curves!

They proved two or more sliders can be put on the *same* zipper track—to provide openings at any given point with smooth closures in both directions!

In fact, they made more big, important improvements in zipper design than anyone dreamed possible. (See complete list of Crown superiorities below.)

But perhaps the most important thing they proved is that zipper designs don't *have* to be "frozen"—zippers can be *adapted* to the *job!*

When *you* turn to postwar, Crown engineers will be able to show you exactly what this means in terms of longer zipper life and easier operation on aircraft equipment. Crown engineers will adapt—or, if necessary, *create*—special Crown Zippers to meet your own individual manufacturing problems!



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3. Provides opening wherever you want it

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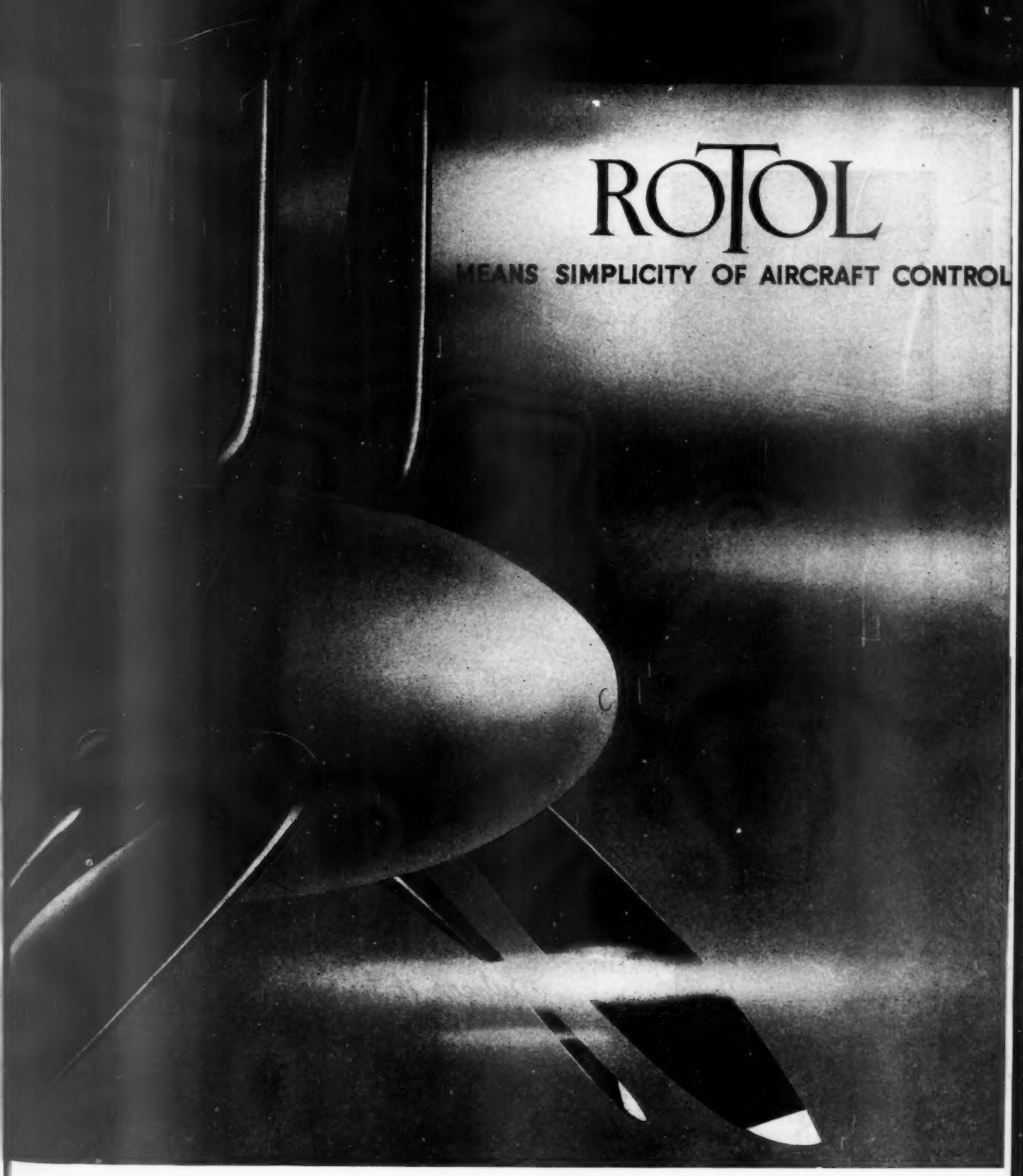

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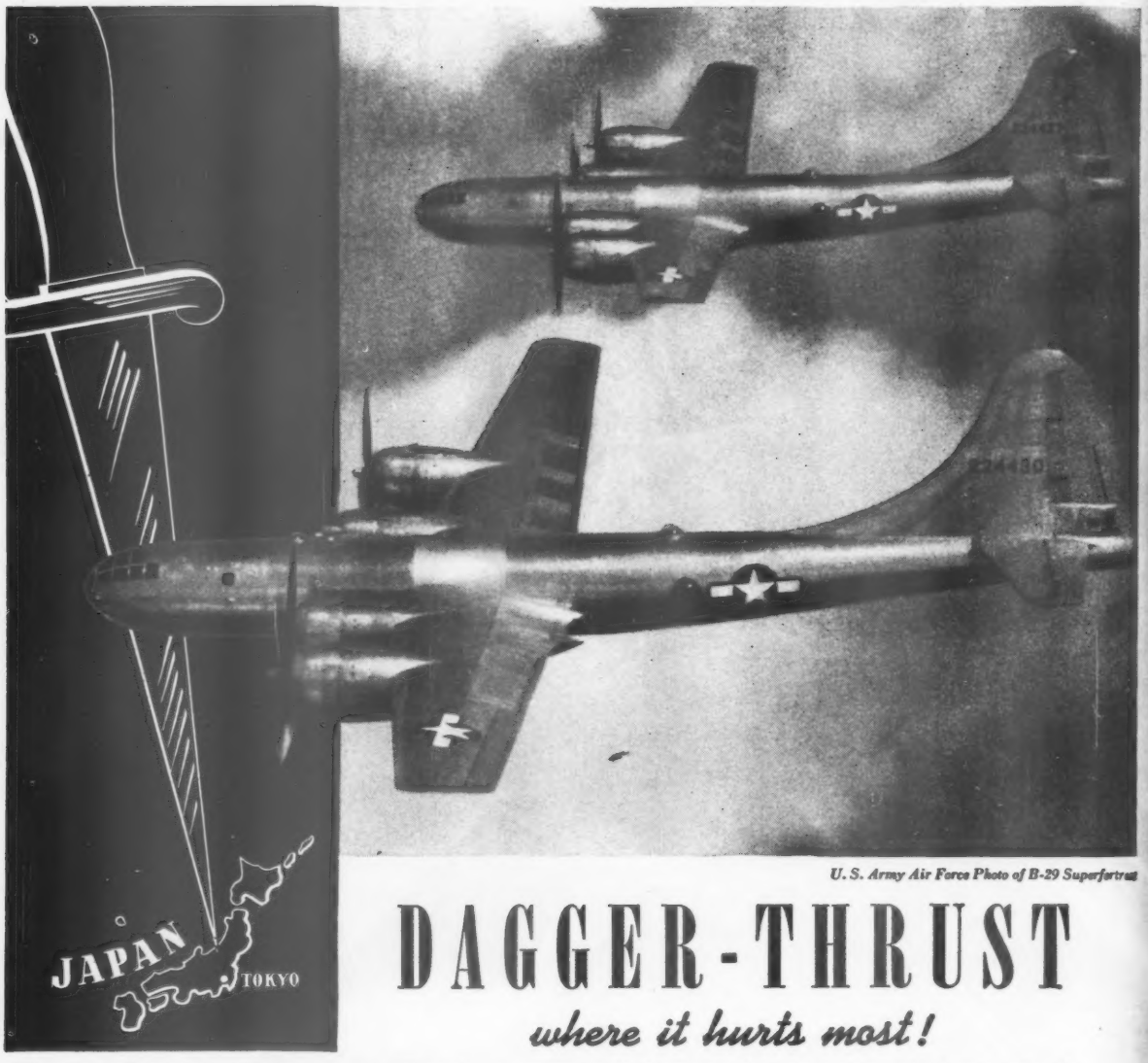

The great B-29 Superfortresses are Ceco equipped.

U. S. Army Air Force Photo of B-29 Superfortress

DAGGER-THRUST

where it hurts most!

There is no sneaky, knife-in-the-back quality about the fierce stabs of these massive B-29 Superfortresses at the heart of Japan. The Nips expect them . . . warning systems tell when they're coming . . . fighter planes take off to meet them and ground defenses throw up a curtain of flak. But nothing yet devised can stop these sky-giants from delivering their loads of destruction *when and where it hurts most.*

The skill and genius that designed, engineered, and produced this "blitz on wings" is American to the core. It is typically American to build the most powerful and complicated flying mechanism ever assembled . . . *and then put it into mass production.* This means that each one of the thousands of component parts must be as technically and physically perfect as man and machine can make it. And further it means ceaseless seeking for new ways to achieve still higher standards of performance, stamina, and dependability.

The CECO carburetors and fuel pumps on the Wright engines powering the B-29 — and the CECO engineers and workers here at home — are living up to these specifications.

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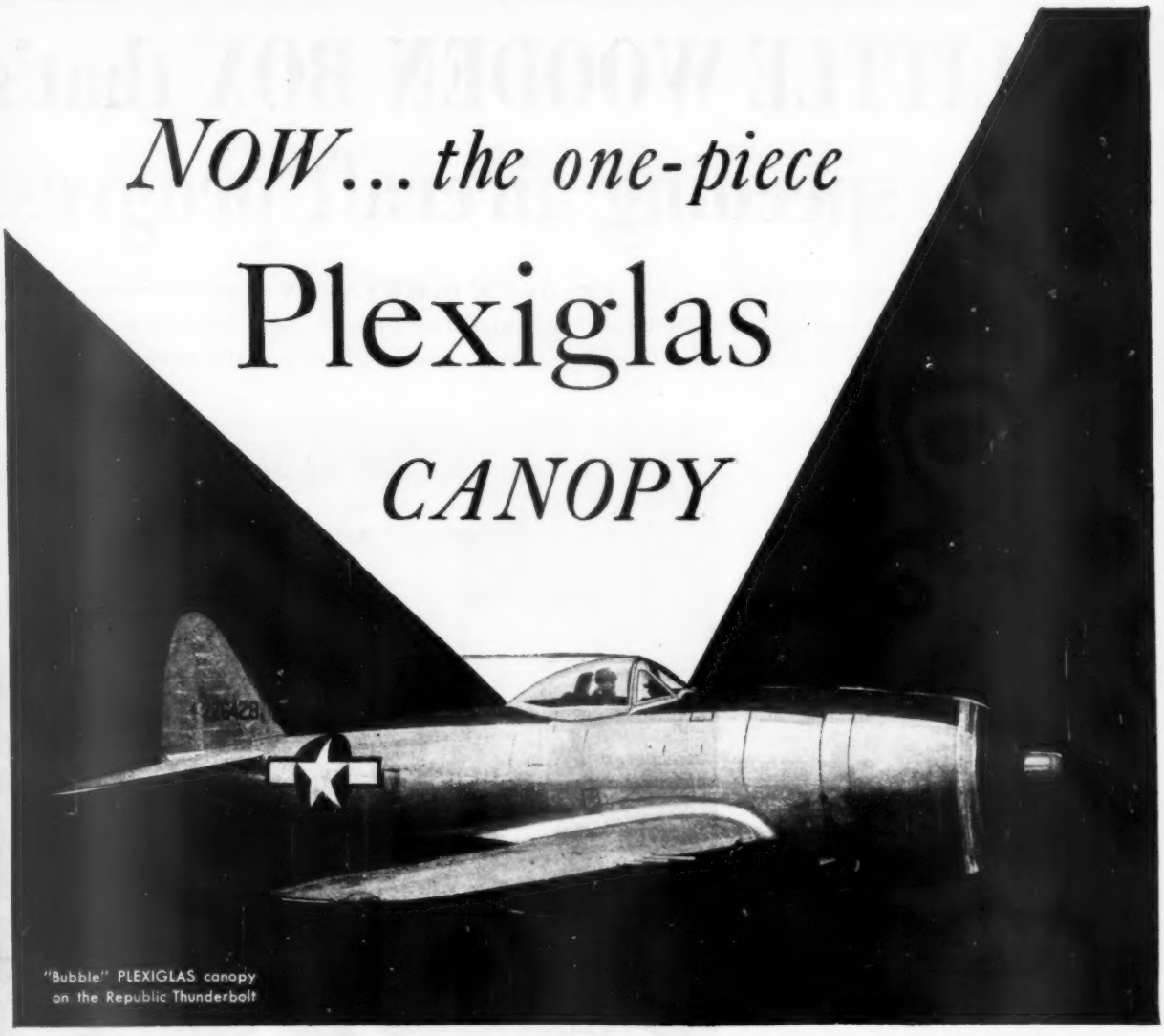

"Bubble" PLEXIGLAS canopy on the Republic Thunderbolt

ON America's fastest fighters, a new type of PLEXIGLAS canopy is saving pounds . . . simplifying installation procedure . . . affording a wider field of unobstructed vision for the pilot.

Developed by Rohm & Haas in close cooperation with the Army Air Forces and the leading aircraft companies, the "bubble" canopy is a single section, requiring no supporting framework of any kind.

Perhaps the most striking feature of the "bubble" canopy is the way it utilizes, to *new* advantage, the long-familiar characteristics of PLEXIGLAS.

The unreinforced construction is made possible by the *high strength* of this Rohm & Haas acrylic plastic.

The elimination of the metal supports used in earlier designs increases still further the weight savings resulting from the *lightness* of PLEXIGLAS itself.

Removing all obstructions from the pilot's range of vision, the canopy gives full scope to the plastic's *permanent transparency*.

These features of PLEXIGLAS . . . strength, light weight, permanent clarity... have been convincingly demonstrated in 8 years of active flying service under all weather conditions. They're the features *you* will want on your post-war plane. In enclosures and other transparent parts, look for "Aviation's Standard Transparent Plastic."

***Only Rohm & Haas makes* PLEXIGLAS**

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A LITTLE WOODEN BOX that's speeding aircraft progress

By JOHN B. KENNEDY

Famous news analyst tells how "Suggestions for Victory" from Bell Aircraft employees have saved thousands of dollars of the taxpayer's money and a comparable number of manhours

"IN every Bell Aircraft plant you'll see suggestion boxes. Into these boxes Bell Aircraft employees, who think while their skilled hands are at work, last year deposited 4200 ideas to improve plant operations and Bell Aircraft products. One third of these, after being cleared through Bell Aircraft's Patent Office, have been put to work. As a result thousands of dollars have been saved in the cost of building Bell airplanes and other war weapons. Other suggestions are helping to speed Victory by saving thousands of manhours.

"Take the case of a supervisor of Intra-Plant Traffic in one Bell Aircraft plant. His plan for simplifying the operation of the conveyor system, by which workers receive material and parts, eliminated 54,561 telephone calls per week—totaling a yearly saving of $39,845, to say nothing of time.

"Instead of a telephone operator notifying the station that supplies are on the way, when the conveyor passes a certain point, it lights an electric bulb. This signal notifies the worker to be on the lookout.

"This new system is one of many production methods suggested by Bell Aircraft employees that are now in use in other Allied Aircraft plants.

"Bell Aircraft workers are making every effort to speed the day of Victory. When that time comes, you can trust this same manufacturing skill and ingenuity to bring you many things to make for a better world at peace."

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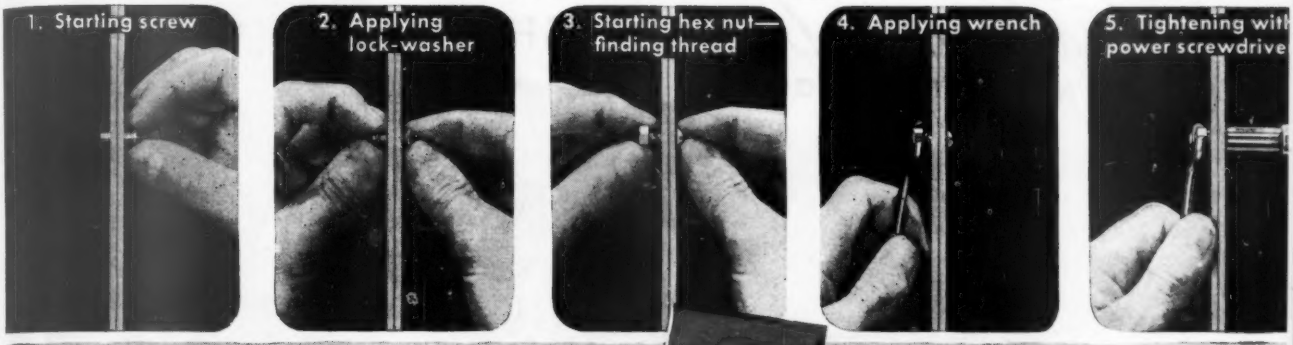
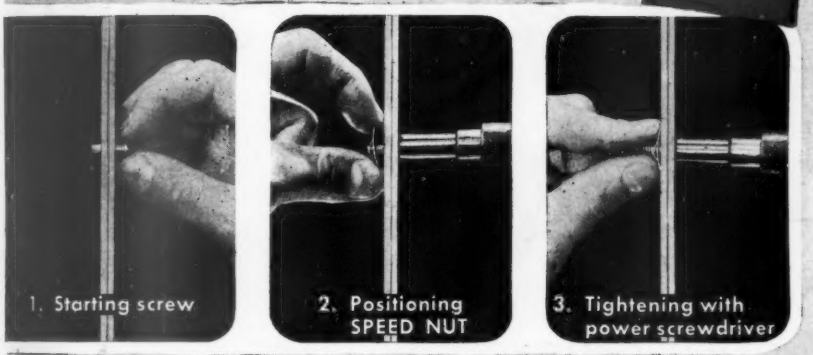
GEORGIA DIVISION
Marietta, Ga.
B-29 Boeing Superfortress

● Bell Aircraft Corporation

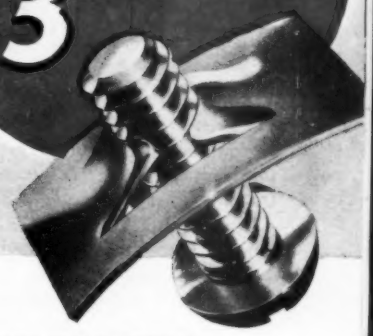
Which is Better?



THE OLD WAY WITH 5 HAND OPERATIONS



OR THE SPEED NUT WAY WITH ONLY 3 OPERATIONS



And a **SPEED NUT** is a self-locking nut, too, that weighs less, stops vibration loosening and cuts assembly costs 40-50% . . .

The SPEED NUT method requires only 3 hand operations as shown in photos above. And only 2 parts are needed instead of 3. Why go through 5 hand operations when only 3 are necessary? Why handle 3 parts when only 2 are required? For an eye opener on the economies of the SPEED NUT system just multiply this 40% motion-saving by the millions of fasteners you use per month. Then add to that the saving by eliminating 1/3 of the parts. Your figures will amaze you. The winning products in postwar competition will be those that are assembled faster and protected against loosening from vibration. Billions of SPEED NUTS were used before the war and on war products, too. More billions will be used on postwar products. Over 2,000 shapes and sizes. Engineers who move up faster are those who know how to make assembly lines move faster. Write for literature.

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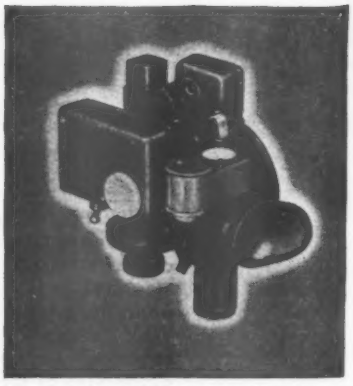
For Fairchild also is leader in the manufacture of these critical instruments . . . more of them being produced for our air services than all other types combined.

Based on designs suggested by U. S. Army Engineers, the Fairchild SEXTANT is distinguished by its extreme compactness and light weight, and its skillful "balance" for handling ease. An improved air reservoir chamber has been provided, too, the bubble now remaining "stable" during the entire sighting cycle. And recording of the consecutive sights has been made automatic, with the duration of the sighting cycle optional.

Thus in SEXTANTS, too, Fairchild leadership stems from its development policy of engineering from bedrock, and supplementing *sound design* with *precise manufacture* and *craftsmanship*. Look for many of these Fairchild developments . . . optical as well as electronic . . . to find widespread industrial application when "tomorrow" comes.



With the Fairchild A10A SEXTANT, *one* press of the trigger gives the navigator automatic interval recordings for any desired sighting cycle. Thus collimation is never disturbed by the necessity of recording each individual sight.

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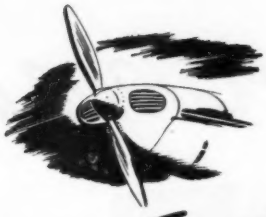

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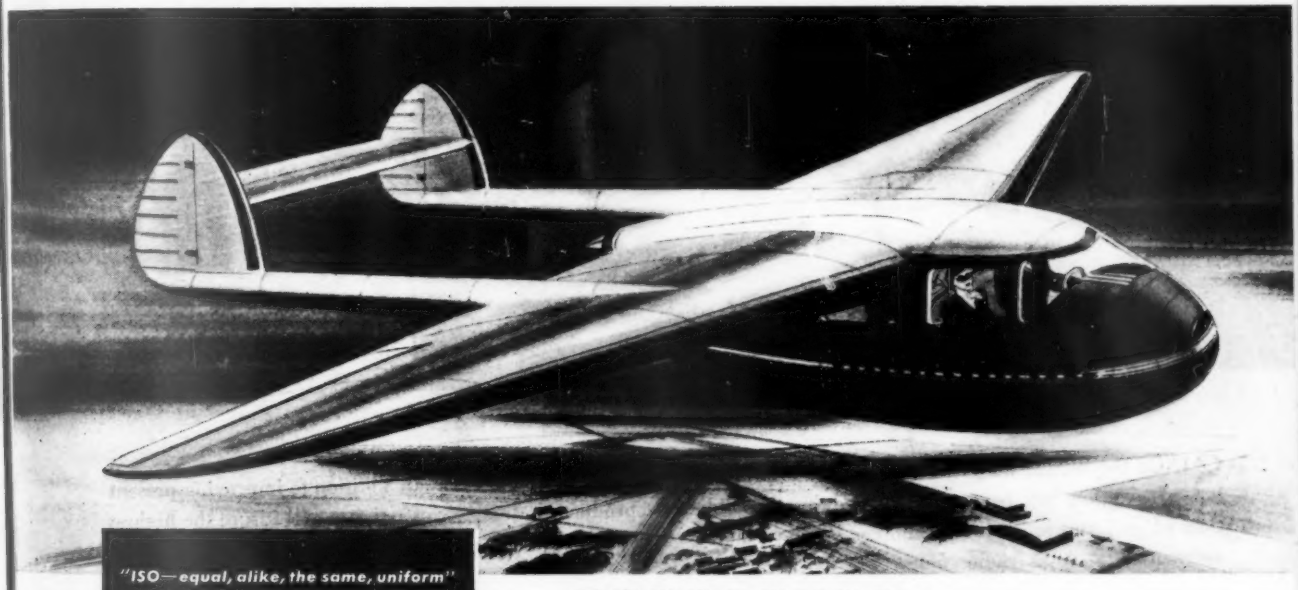

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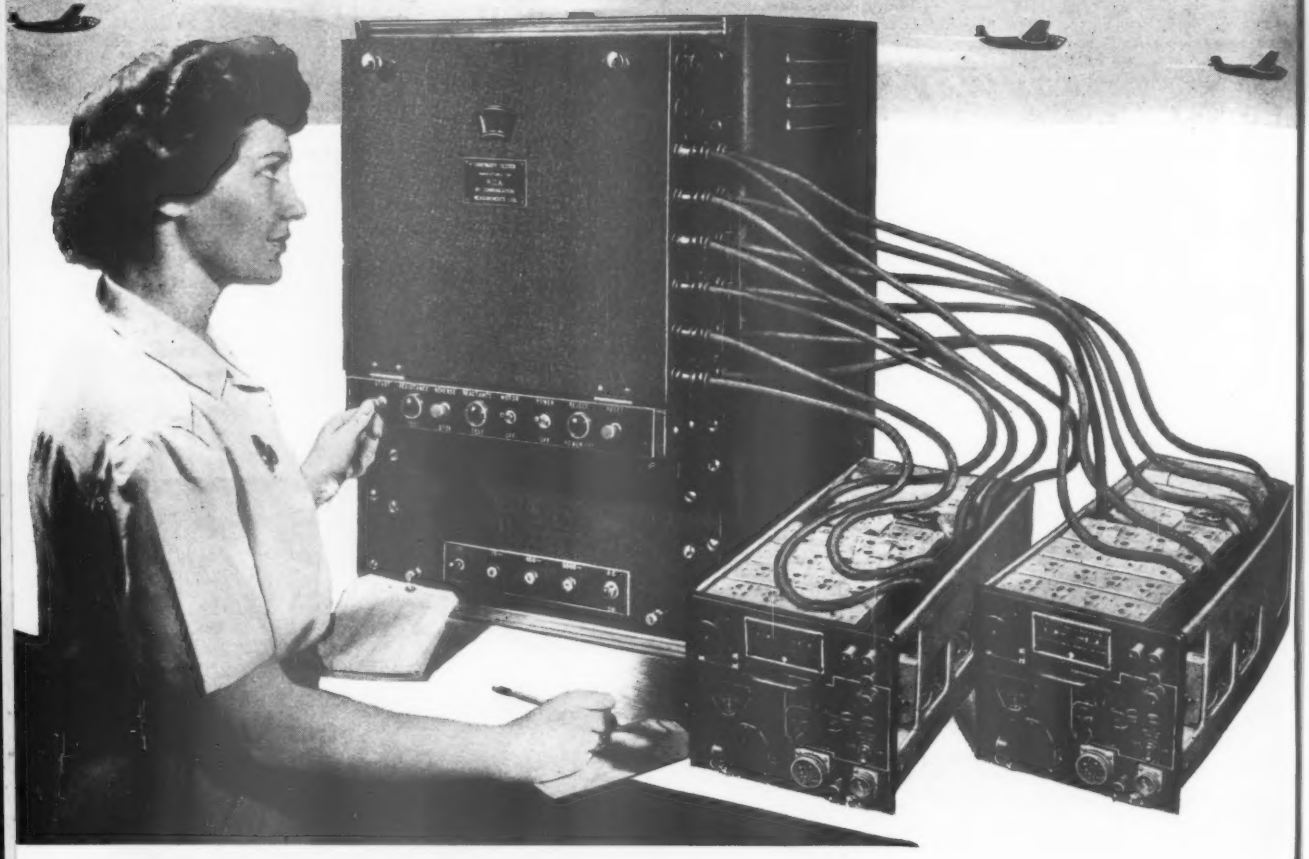

SINCE the Wright Brothers' first flight, the progress of aviation has been accompanied by the addition of one inspection after another. Today, major accessories, such as radio, must pass more rigorous inspections than were applied to engines a few years ago.

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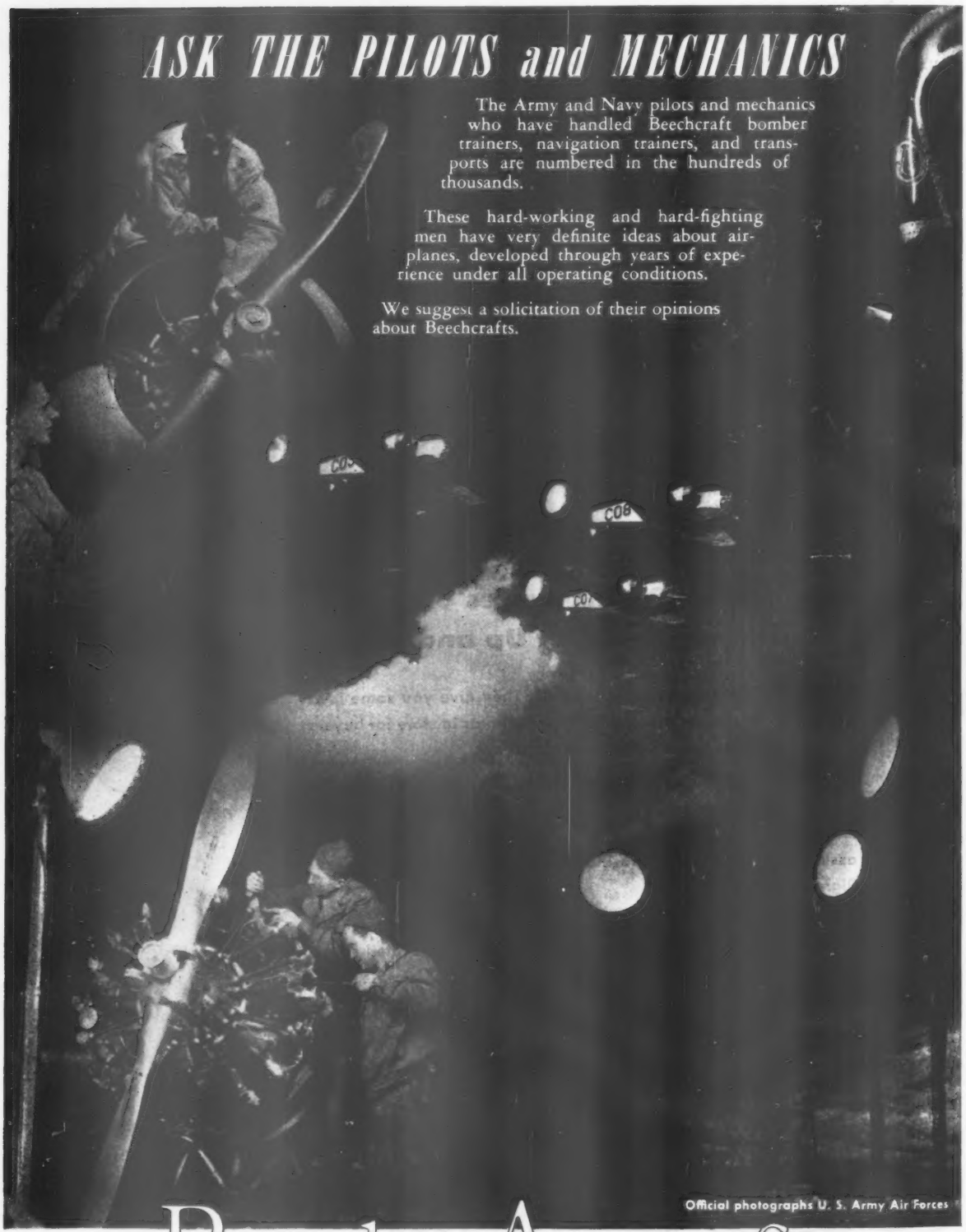
ASK THE PILOTS and MECHANICS

The Army and Navy pilots and mechanics who have handled Beechcraft bomber trainers, navigation trainers, and transports are numbered in the hundreds of thousands.

These hard-working and hard-fighting men have very definite ideas about airplanes, developed through years of experience under all operating conditions.

We suggest a solicitation of their opinions about Beechcrafts.



Official photographs U. S. Army Air Forces

Beech Aircraft
CORPORATION

BEECHCRAFTS ARE DOING THEIR PART WICHITA, KANSAS, U. S. A.

FLEXIBILITY OF AIR POWER

Superfortress bombing Manchuria illustrates an application of technical flexibility. This plane was developed specifically to solve strategic problem of bombing Japanese industry.

By Brig. Gen. HENRY J. REILLY, O.R.C.

Air power has great advantages in its tactical and strategical flexibility. Only beginning to be exploited is another flexibility — technical.

THE war is now approaching a crisis. The final chapter of the German struggle is at hand. When it ends, the United Nations for the first time will be able to concentrate their sea, ground and air forces against Japan.

The fullest use of the wonderful powers of aviation can greatly hasten the fall of Germany and the beginning of the attack on Japan. Failure to use aviation to its fullest extent has been largely responsible for continually dragging out the war.

As this is being written, it is five years to the day since this writer, having spent the month of August in England, flew back to Paris on the day before war was declared. In 1914 I arrived in Paris early in September during the first Battle of the Marne and, except for two short trips home, was there throughout that war. It was four years and three months long.

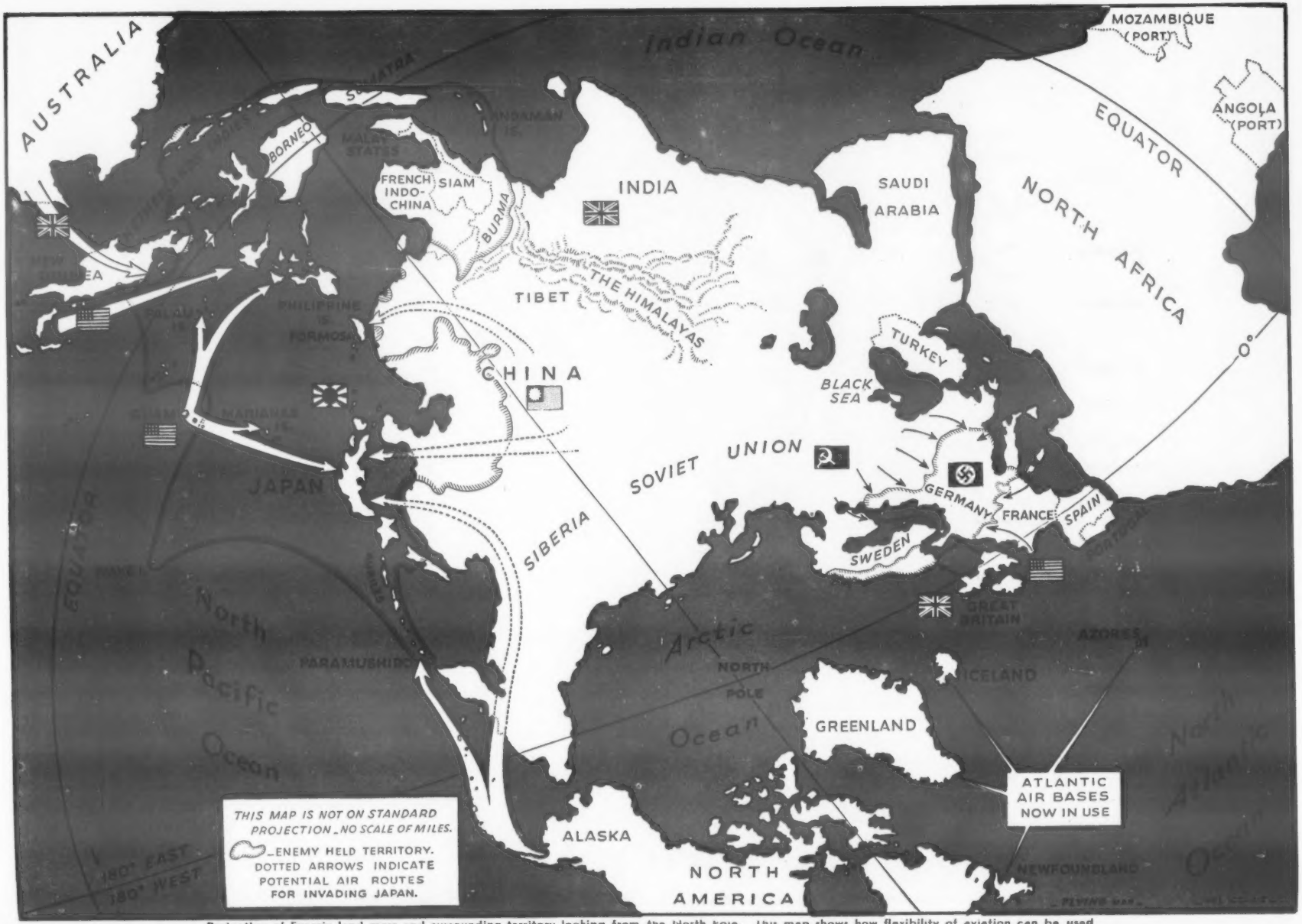
After five years we are now only reaching that part of France in which the last war began and ended. We have not conquered all of Italy which was on our side the last time, nor have we met in battle the main Japanese fleet or army which were also on our side the last time.

Therefore it is of the utmost importance that we use to the maximum the service in which we have the greatest superiority —aviation. By taking the fullest advantage of the flexibility of aviation, which we are not now doing, we can finish off Germany much more quickly than with our present strategy and tactics. By using this flexibility to transport all our aviation in the European theater to the Pacific theater of war to reinforce the aviation already there, we will utterly swamp Japan.

Besides the strategical and tactical use of aviation's flexibility, there is a third flexibility which should be more fully exploited. It might be called "technical" flexibility. The *Superfortress* is one example of technical exploitation. The little artillery observation planes, flown by artillerymen and directly under artillery command, which have proven so useful to American and British artillery is another example.

What is meant by the flexibility of aviation?

While the dictionary gives various



Projection of Euresia land mass and surrounding territory looking from the North Pole. This map shows how flexibility of aviation can be used to concentrate air power against Japan. It points up isolation of India and free China, and indicates that best land bases would be in Siberia.

definitions, probably the words "versatile" and "supple" best cover what is meant by flexibility in this article.

Then the question is: Can this flexibility be better used than it has been up to the present to end the war more quickly?

Strategically and tactically, the flexibility of aviation depends upon its limitations and its powers.

Probably the greatest limitation of aviation is its dependence upon bases from which to operate against the enemy. This is true whether the aviation is land-based or ship-based.

While some of aviation's more fanatical supporters claim that ship-based aviation is not necessary because the right kind of land-based aviation can reach any spot on adjacent oceans or cross them, the war increasingly shows them to be wrong.

Ship-based aviation is a necessity for two reasons: First, tremendous distances, such as those of the Pacific, cannot otherwise be negotiated for combat purposes. Second, the continuity of fire necessary to win in battle cannot be obtained when planes are flying long distances from land bases. Battle needs require that planes fly short distances from the ships which have carried them close in to the attack.

Strategical and tactical flexibility is measured by three things:

1. The various operating radii of airplanes while carrying ammunition from their bases to attack the enemy. Of course, the greater the distance, the less the war load which can be carried.

2. The availability of bases capable of handling the number of planes needed for any combat operation. It is readily seen that there is no use to assign 2,000 planes to an operation if the bases available can handle only 500.

3. Having at the bases a sufficient supply of ammunition and the materiel and personnel to send out the number of planes as often as necessary to carry out the mission.

The closer to the enemy, the greater the loads that can be carried, the greater the number of sorties, and hence the greater the firepower.

If land bases can be obtained close to the enemy they are much more advantageous than ship bases because, just as aviation depends upon bases, so do surface ships. Therefore while surface ships can bring aviation close to the enemy for the period of combat, sooner or later they must return to land bases.

The Japanese planes which attacked Pearl Harbor were ship-based. The nearest Japanese bases from which the ships could operate were in the Marshall Islands. The distance to these bases is probably one of the main reasons why the attack on Pearl Harbor and the Hawaiian Islands was not resumed.

The Pacific situation is in marked contrast to the American and British air attack on Germany because Britain, only a short distance from the continent of Europe, furnished a large number of land bases.

The greatest limitation to aviation is the necessity to provide at the bases everything needed to maintain the number of planes demanded by the operations. Britain has furnished some of this maintenance but a large part of it has had to be shipped from the United States.

Because of this fact, the amount of shipping available to carry ground troops has been reduced to the point where the number of troops necessary for the invasion of the continent could only be accumulated over a long period of time.

This situation delayed our invasion.

Example of technical flexibility developed for specific tactical purposes is Mitchell medium bomber with eight forward-firing machine guns and hard-hitting .75-mm. cannon.

The best time to have invaded was when the Germans were shut up in Stalingrad. During this period the Germans needed a very large proportion of their reserves. They had to reduce greatly the forces available for defending western Europe. They were hundreds of miles from their own territory in the interior of Russia.

Our loss of the opportunity to invade Germany then was due to our giving first priority to heavy aviation bombers with the primary mission of destroying Germany's means of making war. This, in fact, is why the war is still going on.

The bombing of Germany's war industry has undoubtedly done enormous damage and diminished her ability to make war. But it has not proven decisive. The course of the war to date has proved that only an invasion could be decisive. The Russians insisted on this all along.

Had we followed the Napoleonic idea of crushing the enemy in the field instead of believing that we could crush him by strategic bombing and thus restricted our use of aviation to this narrow field, we would have apportioned the available shipping to all types of aviation. This would have taken advantage of its many combat uses—in other words its flexibility—and at the same time made room for the number of troops needed for an earlier invasion. By thus balancing our aviation and ground forces we could have invaded the continent many months before we did.

Even after our landing in Normandy, it was approximately two months before direct aviation support to our ground troops was given. Until this direct support was forthcoming, the landing had not become a real *invasion* because the troops were held within a limited space. When direct support was given, we rapidly expanded our *landing* into a real *invasion* and began the campaign which, as this is *written*, is rapidly driving the German forces from France.

Earlier heavy direct aviation support to the ground troops could have started the real invasion within a month after we finally landed, instead of two months.

If from the beginning, the plan had been to invade Europe from the west as quickly as possible, equal precedence would have been given to the ground troops and the aviation necessary.

Such an aviation strategy would have been very advantageous to aviation itself because the sooner we invaded successfully, the sooner we could have air bases on the continent and the closer we would be to the enemy for our tactical air operations. This would have meant greater loads and more sorties.

General Eisenhower's estimate of the situation in France shows that in the hard fighting up to and including the final retreat of the German troops to and across the Seine, 43 German divisions of the 60 available in France had been used up or greatly worn down by battle.

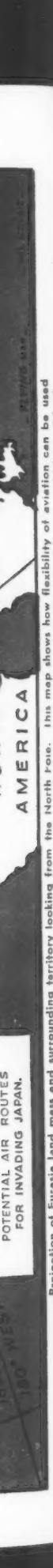
Note in this connection that there were not more than six or seven German divisions within the immediate vicinity of our landings. Therefore 36 or 37 German divisions had to come from other parts of France to reach the battlefield in Brittany and Normandy. The fact that these divisions reached the battlefield and did fight is conclusive proof that air bombardment of roads, bridges and railways, though taking its toll, was not decisive.

In other words, the campaign in France is one more proof that the theory of gaining victory by forcing the enemy's armed forces to combat and, in the ensuing battle, draw in as many enemy reserves as possible and destroy them is still the quickest way to victory. Aviation bombing of "the means to make war" in the rear of the enemy's armed forces has not changed this fundamental principle.

Instead of being a substitute for the ground forces, aviation is a welcome and powerful addition which, if used with the ground forces in combat under the command of one man, can produce a more decisive result than was possible before the days of aviation. The firepower of aviation makes a tremendous addition to the total firepower when it is added to the firepower of the ground forces instead of being dispersed all over the country in their rear. When properly used, its great flexibility is of the utmost value in the assault, the break-through and the pursuit of enemy troops.

After the decisive battle comes the pursuit of the enemy's defeated forces. If that pursuit is carried on properly and relentlessly, these forces can be prevented from ever making another stand and thus the war can end with complete victory.

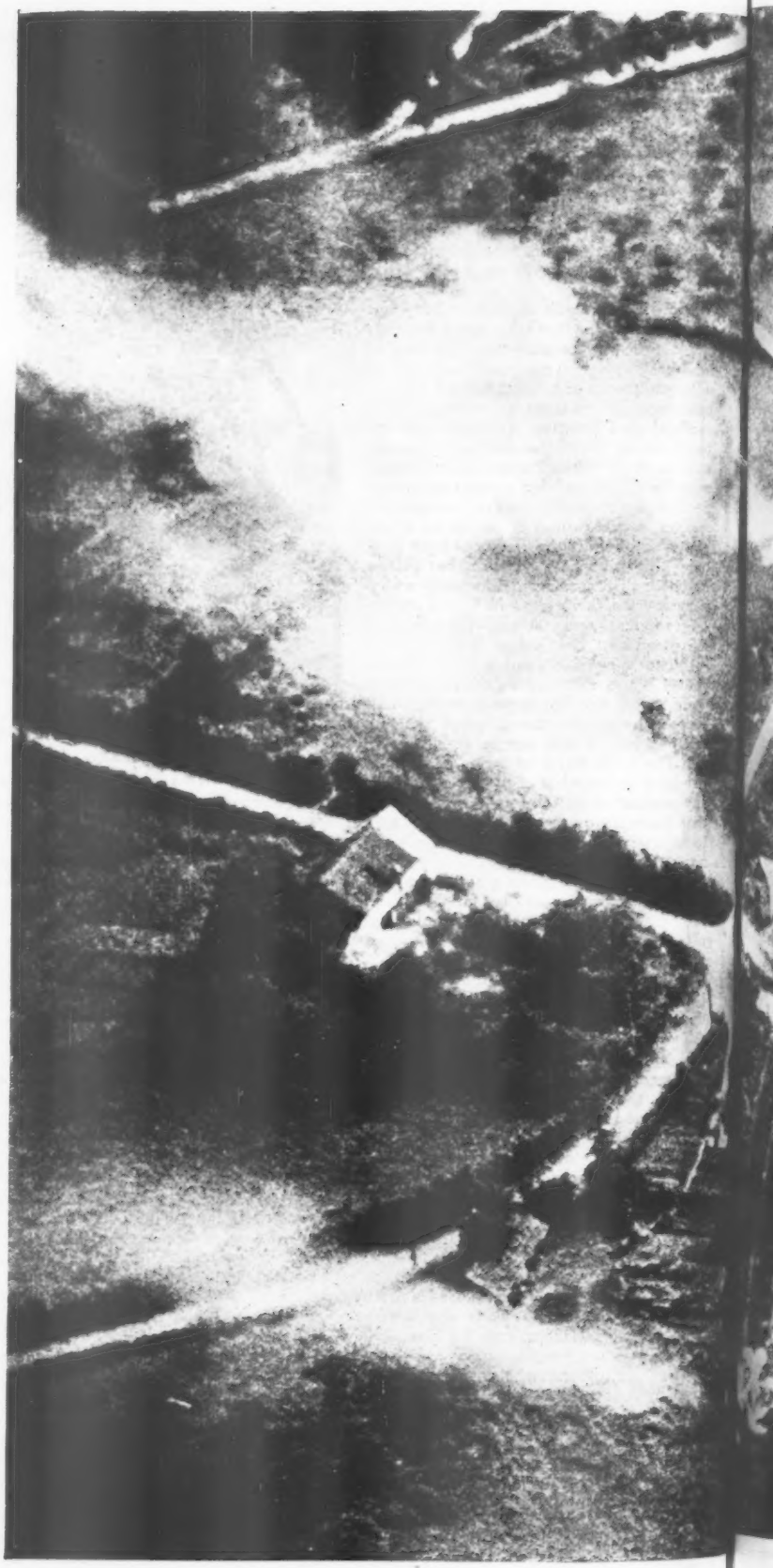
(*Continued on page* 136)


AMERICA
POTENTIAL AIR ROUTES
FOR INVADING JAPAN.
Projection of Eurasia land mass and surrounding territory looking from the North Pole. This map shows how flexibility of aviation can be used to concentrate air power against Japan. It points up isolation of India and free China, and indicates that best land bases would be in Siberia.

AIR TACTICS IN FRANCE

By
KENNETH R. PORTER
FLYING'S European Correspondent

Blasting a path for troops, AAF speeds drive on Reich by close tactical support.

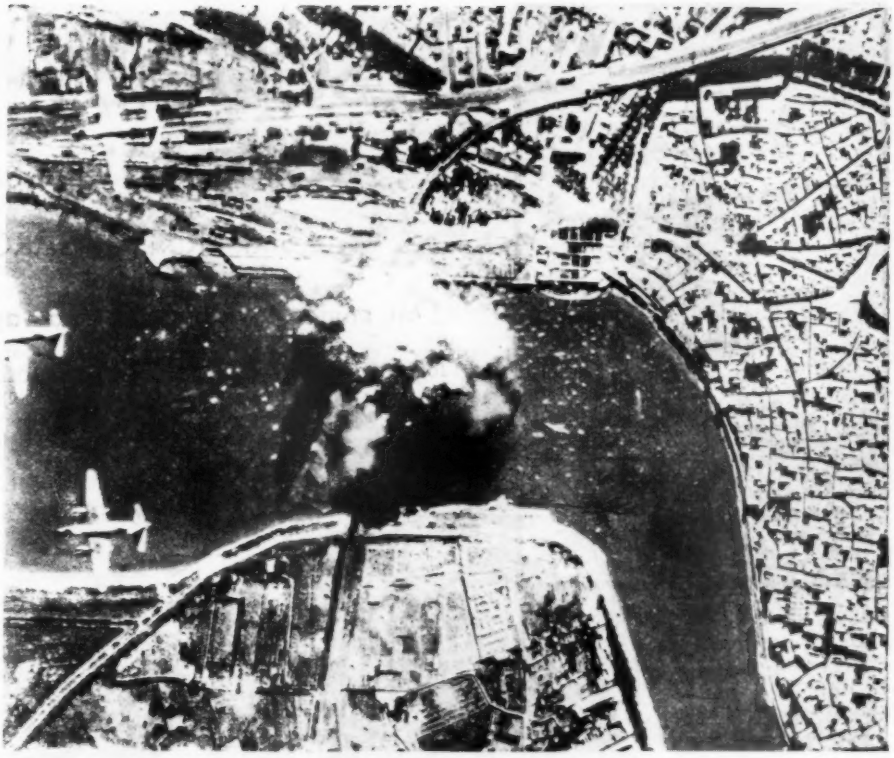


Ninth Air Force Advance Headquarters, Somewhere in France

ON the second anniversary of the American air offensive launched from Britain on Hitler's "impregnable" Europe —on August 18, 1944, or D-plus-72, to be exact—the greatest disorganized retreat in the history of air warfare got under way as German mobile, tank and ground forces fanned out in utter rout from between Falaise and Argentan, two small villages in Normandy. It was Germany's Black Friday—a day of complete Allied supremacy.

That anniversary day bag for the combined Allied air forces totaled more than 3,800 transports destroyed or damaged, 124 tanks smashed and 96 crippled, scores of half-tracks, field cars and jeeps (or their German counterparts) destroyed, ammunition and supply dumps and fuel depots blasted to ruins. In all, 5,000 sorties were flown by Allied aircraft. But the striking thing about this "aniversary celebration" of the American air offensive against Germany was the almost complete concentration of combat aircraft for tactical purposes.

The smashing effectiveness of this comparatively new use of the AAF in tactical warfare might well cause one to overlook the *strategic* air warfare that made its success possible. On this same day—just two years before—12 *Flying Fortresses* of the Eighth Air Force took off



Marauders of the AAF's Tactical Air Force score a perfect strike on railroad bridge across the Rhone River. Accurate bombing of this sort has prevented the movement of enemy reinforcements, scattered retreating forces, and impeded counter-offensives.

Fighter-launched rockets, their smoke trails visible, mark (left) destruction of German communications. An example of their striking power is this lane (above) typical of miles of wreckage-strewn escape highway.

from an American airfield in England to bomb rail yards at Rouen as the initial step in the greatest of all strategic air offensives. Since then, nearly 300,000 tons of high explosives and free bombs have been dropped by the Eighth on strategic war industries in Europe.

During this 24-month campaign, the Eighth Air Force had flown 301,000 sorties from Britain—162,000 by *Flying Fortresses* and *Liberators* and 139,000 by *Mustang, Lightning* and *Thunderbolt* long-range fighters—or an average of nearly 413 sorties a day.

Briefly that is the record—the two-year record of the Eighth Air Force. Its mission was, and is, strategic. It is a long range air force; its purpose is to cripple *potential* power. It concentrates on the destruction of factories and installations which would aid the enemy in the future. In comparison, the mission of the Ninth Air Force is purely *tactical*. Its purpose is to give close support to ground forces—to clear the way for the steady advance of troops.

Taken together, the thorough-going strategic warfare of the Eighth Air Force and the more recent tactical blitzkrieg of the Ninth represent an approach somewhere between that of the Russians and Germans who emphasize tactical air warfare and the British who emphasize strategic air warfare.

The air policy of the AAF is outlined in the field regulation booklet of the War

(*Continued on page* 84)

H-shaped direction-finding antenna is part of Adcock direction finder located in this hut. The "H" is rotated and brought to bear on signal by man inside hut.

RESCUE BY RADIO

By OLIVER READ
Managing Editor, Radio News
and ERNEST BARCELLA

Lost planes equipped with two-way radio can now be located unerringly by RID direction-finding system.

This Liberator, flying over the ocean, could be located easily by direction-finding system within a few minutes if it asked RID for help.

ON Christmas Eve, 1940, a lost Douglas DC-3 unwittingly proved to be a most benevolent Santa Claus. Its aimless wanderings were destined to bring to this nation and its armed forces a direction-finding service that has since shepherded hundreds of lost planes to safety.

This service was to play an extremely vital role a year later, immediately following Pearl Harbor. It was then that the aircraft direction-finding service of the Federal Communications Commission's Radio Intelligence Division (RID) was to make its most timely contribution to the national defense.

For sometime RID's long-range direction finding had done a valiant job in another important way—policing the air waves in search of illegal and espionage stations. But not until the night of December 24, 1940, did there develop the idea of utilizing these direction finders in another role—locating lost or distressed aircraft equipped with two-way radio.

That was the night that the DC-3 with full crew and passenger complement, was lost in the vicinity of Tucson, Ariz. For three hours the big airliner flew in circles trying to find a landing place. Finally it came down.

That episode gave the airlines an idea. Soon afterwards they contacted RID and asked if it would be possible for that agency to use its long-range direction finders as an aid to lost planes.

How quickly that idea was realized is attested by the following memorandum, dated March 27, 1941, from the RID monitoring unit at Tucson.

". . . . Yesterday about sundown CAA Tucson called and reported an itinerant ship lost.

"The pilot was positive that he was northeast of El Paso. Although we were forced to take bearings with the Adcock on five- and ten-second transmission, we were able to report a bearing in a few minutes. This bearing was so far from the ship's estimated position that it was completely discounted. The ship finally reported that he was landing in a small clearing—position unknown—out of gas.

"At 6 a. m. today, the pilot finally reached a telephone and reported that he was in Sonora, Mexico, near a small town.

"Plotting this position on the map indicated that we had given a bearing good to better than two degrees, that the ship was south of Douglas, Ariz., and that if the pilot had followed the information given by this office he would have been able to land at Douglas or Tucson before running out of gas. It is believed that this situation is being made a part of the Civil Aeronautics Administration's official report, since they seemed to be much impressed with the possibilities of the system."

CAA was duly impressed, especially after it received a detailed report of the above incident from H. T. Bean, Superintendent of Airways at Santa Monica, Calif., who recommended that CAA consider using the service.

By midsummer of 1941, after meetings and correspondence between RID and CAA, a procedure was worked out whereby FCC would furnish emergency bearings on lost aircraft. All CAA regional managers were notified of the availability of this radio direction-finding service and were given a list of addresses of RID primary and secondary units.

From these incidental beginnings, RID

developed an elaborate system of locating lost or distressed aircraft by Adcock radio bearings, a system which:

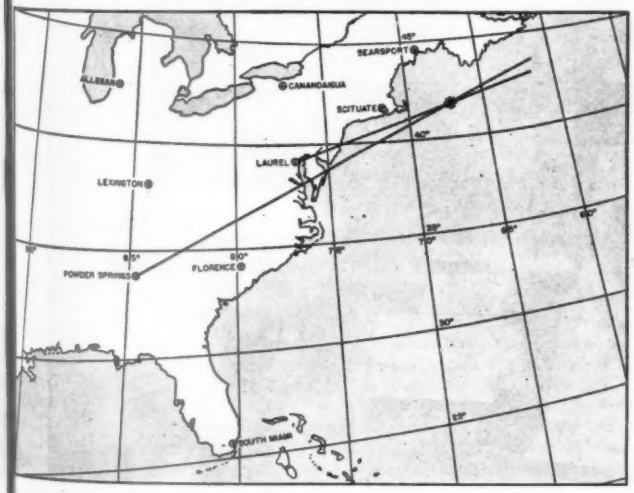
1. Greatly aided the United States in its war against Japan.
2. Guided safely home more than 500 bombers and other warplanes.
3. Came to the aid of the nation's anti-submarine defenses in the ominous days of 1942.
4. Saved scores of shipwrecked merchant seamen.
5. Saved millions in expensive planes which otherwise might have been lost and achieved a saving of many hundreds of human lives.
6. Will add another great measure of safety to post-war flying.

How does the RID system work when a plane is lost?

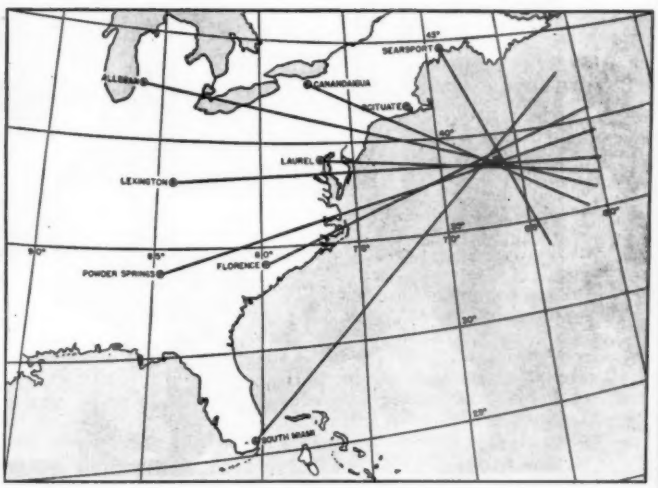
The telephone rings at the RID Eastern Intelligence Center at Washington. The call is coming in from the CAA Airway Traffic Controller at the Washington National Airport. The time is 10:28 p. m. EWT. "Another bunny is lost," the voice reports. This information is followed by the call letters, frequency and the time of emission (phone, code, etc.) of the plane's radio transmission. Immediately the RID officer on watch types out "LOP" on his teletypewriter. The message appears simultaneously on the TLT (teletypes) of other primary monitoring stations—in this particular case, on the east coast. The cryptic word "LOP" is the emergency alert signal which indicates that a plane is lost and is seeking a bearing.

Operators on duty at the monitoring stations in that area immediately tune their receivers to the exact frequency supplied and listen for signals from the lost plane. In most cases, the plane is instructed to send a series of MO's comprised entirely of dashes. This coding lends itself to easy reception. The operators on duty at the Adcock long-range direction finders are alerted over an intercom system connecting to the cruising

Never a dull moment in this hut where a continuous alert must be kept over the entire radio spectrum. Strange signals are located whatever their source and their position is given to other stations instantaneously. Wheel rotates "H" antenna and is calibrated to true north.



A plane is roughly located east of Cape Cod by two stations which, because of their position, have left a very wide margin for error.



Reason for taking numerous bearings is illustrated here. Location of plane is accurately known while that at left is quite uncertain.

Mobile units "close in" on area plotted by long-range direction finders after fix is radioed from Washington. By communicating with other mobile units, they locate plane almost exactly.

room in the main building of the station. The operator tunes immediately to the frequency supplied over the intercom and by the exchange of information back and forth makes sure that he is listening to the signals which are the subject of observation. He proceeds to take a long-range bearing which is sent to the Eastern Intelligence Center over the teletype network. Other DF operators take similar bearings at the same moment and their findings are likewise transmitted to Washington where they are evaluated and plotted in order that a "fix" may be established. It is imperative that several bearings be taken simultaneously, since the aircraft is flying at a high speed and changing position continuously.

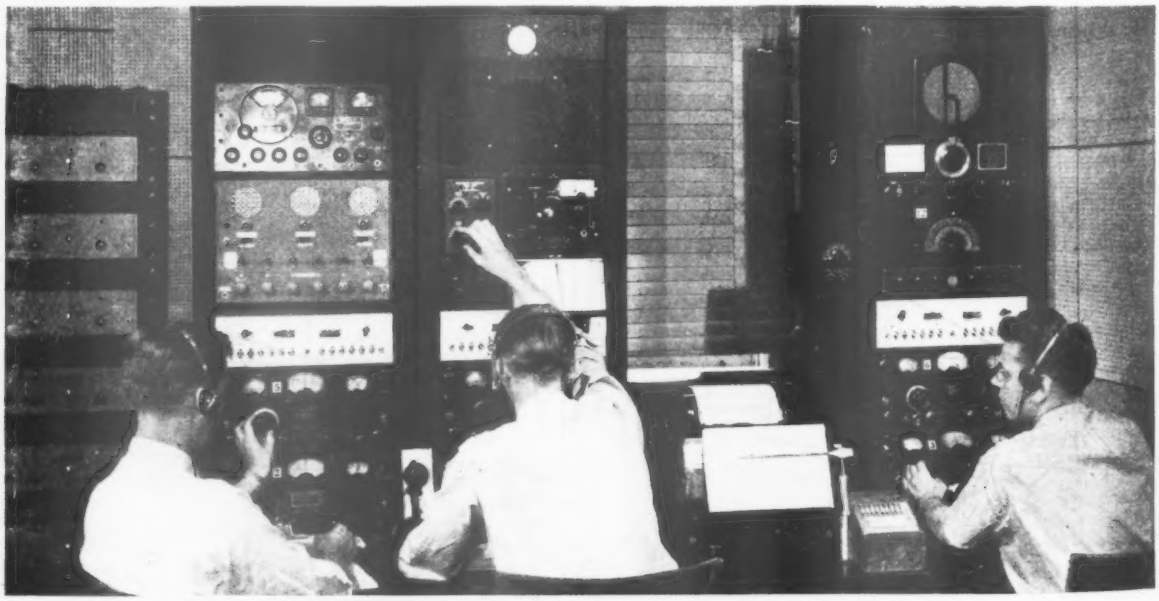
When the fix has been established, it is given to the CAA controller, in this case, and the correct bearing is transmitted by radio to the lost plane. Knowing his position, the pilot brings his ship home.

The most important piece of equipment in the entire RID setup is the Adcock direction finder, a sort of radio searchlight. It consists of an elaborate rotatable beam antenna looking very much like the capital letter "H" stood on its side. This "H" revolves above a small hut mounted some 20 feet above the ground. Within the hut is a Hallicrafters SX-28 communications receiver, a frequency standard used to check the calibration of the receiver, and a large wheel above which is mounted a calibrated scale graduated in degrees with respect to true north. The operator rotates the antenna while listening to the signal under observation until it can no longer be heard. This is known as the "null." By reading the scale before him, he can tell within one or two degrees the exact direction of the arriving signal. So exact is the direction finder that a spiderweb across its transmission line will upset the calibration. It is obvious that in order to take accurate long-range bearings the calibration of each direction finder be known at all times. To insure proper performance, the operator takes "check bearings" on known stations at known distances at certain intervals.

At least four radio bearings are required for an accurate fix. They must be taken from widely separated locations. Accompanying illustrations point out the necessity for taking multiple bearings. The more bearings, the more accuracy will be had.

There are certain instances, for example, when a plane may be forced down with its radio still in operating condition and where short-range bearings would be desirable in order to determine the exact location of the grounded plane. The RID has 50 special mobile units equipped with compact direction finding

(*Continued on page* 142)



Here Radio Intelligence Division operators search radio spectrum for illegal radio transmission or for lost aircraft in distress. The teletype reports pertinent information which is transmitted over the nationwide RID network instantaneously.

FLYING THE AIRACOMET

Army test pilot reports that flight of jet plane is vibrationless, almost noiseless, and incredibly fast.

By Maj.
CHARLES M. FISCHER
Chief Test Pilot, San Bernardino
Air Technical Service Command

I HAVE flown the Army's new jet-propelled fighter plane, the Bell *Airacomet* [P-59A], and found it nothing short of amazing. Soon it may be flying circles—literally—around the remnants of enemy air power.

At a base on the California desert this new propellerless plane is undergoing exacting trials. To the men on the job, it's just "The Jet"—a project to be accomplished. But to the eccentric citizens of the desert, it is an unending source of wonderment. As one old stubble-faced prospector told me:

"I kin make five mile a day if'n I wanna git somewhere. That's fast enough for me. But that thar aeroplane that's swishin' aroun' up thar. Wow! Never heard tell of anything travelin' so fast."

Little did this prospector realize that he and a few other desert wanderers are probably the only unauthorized persons to witness the Jet in its daily test flights. And that is one of the main reasons the site was selected. Here test pilots and crews of the Bell Aircraft Corporation are in close collaboration with the Air Technical Service Command of the AAF.

After my first flight in the twin-engined Jet, I was confident that jet-propulsion is the greatest aeronautical development in more than a decade. Its possibilities are almost boundless. So simple is its design and operation that men of vision in the aviation industry dream of the day when it may provide the answer to post-war demands for a cheap, practical family plane with more style and dash than the much-heralded helicopter.

And as for speed—well, wait until the Jet is hurled into action against the enemy! American fighter planes now in combat can streak in for an attack at a fast enemy fighter not more than twice before the latter can race out of range. On the other hand, the *Airacomet* can fly in circles over an enemy plane traveling a straight course and attack more times than any present fighter planes before the latter makes a getaway. This would mean tremendous advantage in combat.

Jet engines are made up of rotating parts only, thus overcoming the efficiency handicap of pistons which reverse their direction of movement hundreds of times a minute. Its fuselage can hug the ground like a streamlined automobile; there is no need for propeller clearance.

The jet units make so little noise that cattle remain undisturbed with the plane flying but a few feet over their heads. The sound is something like the distant blast of a giant blowtorch. There is so little vibration in flight that special vibrators are installed on the instrument panel to prevent gauge indicator needles from sticking. There is no throb, no sensation of harnessed power, no sound of propeller tips cracking and popping.

There is no static in the radio because there are no spark plugs, magazines, reciprocating engine parts or electric governors. There is no need for carrying the 20 to 30 gallons of oil needed by conventional planes. There are no heavy engine mounts because the jet units can be fastened directly into the aircraft frame.

And—greatest advantage of all—there are no propellers to serve as virtual brakes against the streamlined flow of air in top-speed flight; no propellers to blur vision or reflect sunlight into the pilot's eyes. The jet units are set closer to the fuselage and almost completely out of view. There is no need for cooling units, openings and scoops, because the heat of the engines is utilized in their operation and is not a by-product of it.

To flyers accustomed to cockpits crowded with 100 gauges, levers, buttons, pedals, switches and indicators, the *Airacomet* is almost incredibly simple. Its operation hinges virtually upon a single control—the throttle. Let us take a quick look at how the plane works:

Air flows into the jet units through intake ducts in the leading edges of the wings. After passing through a compressor the air is forced into combustion chambers. Fuel is added and ignited. The resulting hot gases flow through a turbine, which drives the compressors, and from there to a tailpipe where the air is squeezed through a jet under terrifically high pressure. The principle may be demonstrated with a garden hose; the smaller the nozzle opening, the more forceful the stream of water.

It is as simple as that! Blow up a toy balloon, then release it before tying the opening and you have a lesson in jet-propulsion. The balloon will fly crazily in every direction until deflated. If we could build a jet engine in the balloon, flight would continue as long as the fuel lasted.

In appearance, the *Airacomet* is much like any twin-engined Yankee fighter plane now busy making trouble for the enemy on a dozen fronts. Its tricycle landing gear is one of its principal identifying features, for it is so short the plane's wings sit only about three feet off the ground.

Just as there is no need for propeller clearance off the ground, there is no need for clearance with the fuselage, so the engines snuggle up against the body.

Let me give you the impressions of my first *Airacomet* flight. I felt like a Hallowe'en witch riding astride a vacuum cleaner instead of a broom and being pushed through the air faster than anyone has ever flown before.

Capt. Charles Tucker, whom I had taught to fly several years ago and who has since flown in combat with General Chennault on the Chinese front, spent about 15 minutes explaining the plane to me before I took off. I climbed into the cockpit, turned on the battery switch, then the booster pump. Next I pushed the starter button and after about 15 seconds I turned on the fuel valves. With a sudden "poof," like putting a match to a gas stove, the units were fired. I tried the throttles. The acceleration was not

(*Continued on page 146*)

The Skyfarer has fixed fins and no rudder and is steered with its ailerons. A control wheel actuates both ailerons and elevators.

MAKE FLYING EASIER

By EDWARD E. SLATTERY, Jr.

Developments toward simpler flying include linkage of ailerons and rudder, simplified controls, and elimination of foot pedals.

THIS article contains 15 years of pent-up wonder and irritation at the fact that an airplane must be steered by foot control. The physical co-ordination necessary to acquire the "technique" to pilot airplanes is so difficult that it takes many hours of flight practice before this co-ordination becomes automatic and natural. Mastering the rudder control with the feet is one of the greatest sources of flight difficulty for a student pilot; teaching it is the bane of every flight instructor's existence.

To a nation of people long accustomed to steering other vehicles by hand methods, the foot co-ordination of control necessary to steer an airplane is understandably difficult. We "steer" a horse by hand rein; a boat by hand tiller or wheel; tractors, motorcycles, and automobiles by hand control. It may be safely assumed, therefore, that the majority of potential aircraft pilots have been physically and even subconsciously indoctrinated in steering by hand control.

An interesting comparison is presented by the gradual evolution of automobile controls. The "technique" and ability to drive an automobile was once considered a highly skilled accomplishment. Gradually, however, the complicated control system of the automobile was simplified; the original gear shift mounted on the running board was supplanted by one inside the car, and eventually the different shifts in different make cars were standardized. The most recent development in simplification of automobile driving control was the development of Hydromatic drive, accomplishing complete elimination of the foot clutch and leaving only the brake and gas pedal on the floor.

The need for simplification of aircraft control has not yet been fully realized by the aircraft manufacturing industry. Most manufacturers are already tentatively or actively planning design and production of new models ranging from $1,000 coupes to $500,000 multi-engined transports. They are spending thousands of dollars on aeronautical research, yet comparatively little attention or research money has been devoted to simplifying aircraft controls.

Because the co-ordination between hand control and foot steering is difficult to achieve, the main obstacle—the need to steer with the feet — should be eliminated. This could be accomplished without much difficulty because in modern aircraft the *need* for the rudder is becoming less and less important. Instead of being an active movable control surface the rudder seems to be developing into a semi-fixed fin for directional stability. Most large transport aircraft and certain private aircraft can be turned with the ailerons, without using rudder.

Form ACA 545
(Rev. 5-1-41)

UNITED STATES OF AMERICA
DEPARTMENT OF COMMERCE
CIVIL AERONAUTICS ADMINISTRATION
WASHINGTON

AIRMAN RATING RECORD NO. 0000

This Rating Record is not valid unless accompanied by the appropriate certificate bearing the above number.

Name JOHN DOE

Address 1111 12TH STREET NORTHWEST WASHINGTON D C

RATINGS WITH LIMITATIONS

AIRPLANE UNCONVENTIONAL ERCOUPE MODEL 415-C
AIRPLANE UNCONVENTIONAL STEARMAN HAMILTON MODEL Y 1-S
AIRPLANE UNCONVENTIONAL GENERAL MODEL G 1-80
AIRPLANE UNCONVENTIONAL GWINN MODEL 1

By direction of the Administrator:

GEO. J. WOLFE (Civil Aeronautics Inspector) — JUNE 28 1944 (Date of Issuance)

Any change of address should be endorsed on reverse side hereof but only after written notice has been mailed to the Certificate Section, Civil Aeronautics Administration, Washington, D. C. Any alteration of this form may result in the suspension or revocation of the Certificate to which this form is attached. (Over)

This special license is issued to pilots qualified to fly two-control aircraft of the type listed, but not the conventional airplanes controlled by foot pedals and stick.

The flight characteristics of the popular DC-3 commercial transport are such that ordinary turns, gliding and climbing turns, and lazy 8's may be made perfectly without using rudder control. Recently an Air Transport Command pilot back from a three-continent flight in a *Skymaster* reported that he never once touched the rudder pedals from the beginning of his take-off in Washington, D. C., until his return two weeks later. He pointed out that unlike the other controls of the *Skymaster*, no booster mechanism helps actuate rudder movement, which makes the rudder difficult to turn without considerable pressure. He reported further that there was no need for the rudder, that all compass headings, even in rough weather, were maintained perfectly by wheel control of the ailerons alone.

Rudder control in recent years has been mainly necessary during take-off, landing, and taxiing. Even this latter need has now been eliminated, particularly in multi-engined aircraft of single rudder design, such as the DC-3, the *Stratoliner*, and the *Fortress*. The rudder area on these and similar aircraft is insufficient to maintain directional control at slow taxiing speeds because the slipstream flows straight back from outboard wing engines, outside and beyond the rudder control surface.

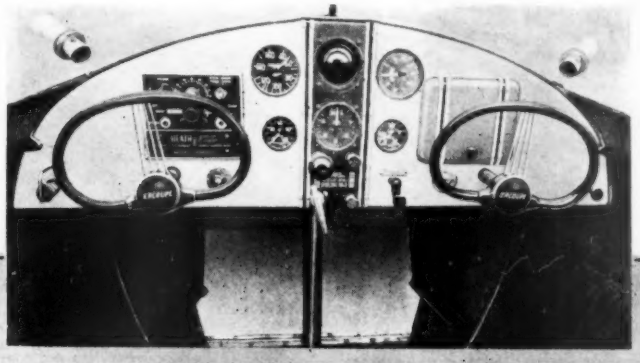
Ground steering control of multi-engined aircraft by individual wheel braking, applied as needed to one wheel or both, is impractical because the small hub of an airplane wheel is unable to dissipate the heat generated by the constant braking action, which may easily become hot enough at fast taxi speeds to blow out a tire. Therefore, steering control is accomplished almost entirely by use of hand throttles controlling port and starboard wing engines. However, with more and more aircraft using tricycle landing gear with a steerable front wheel, the need for the rudder while taxiing is completely eliminated.

Like the automobile, the airplane has many of these mechanical redundancies that only time and experimentation can eliminate. Every improvement that requires less of human skill and judgment will raise safety records and spur amateur interest in aviation.

The evolution of modern multi-engined aircraft design has minimized the use of the rudder in the air and rendered it unnecessary on the ground. This simplified condition of control, however, is not true in present combat aircraft and certain other military aircraft where the rudder is still used in violent-action maneuvers. Neither is it true on most private aircraft, generally small, single-engined airplanes, requiring rudder action both on the ground and in the air. Yet it is in private aircraft that elimination of foot steering would react most beneficially to all concerned.

It would react beneficially for the manufacturer because it would increase airplane sales. The potential private-pilot, private-owner group, which lies somewhere between the 24,000 private airplanes registered in 1941 and the 29,500,000 private automobiles registered the same year, will demand an airplane that is simple to operate. The great majority of these potential pilots and owners will have developed no habit or preference for foot control in steering; may, in fact, be

(*Continued on page* 118)



Cockpit and instrument panel of Ercoupe. The steering wheel gives full directional control and there are no foot pedals.

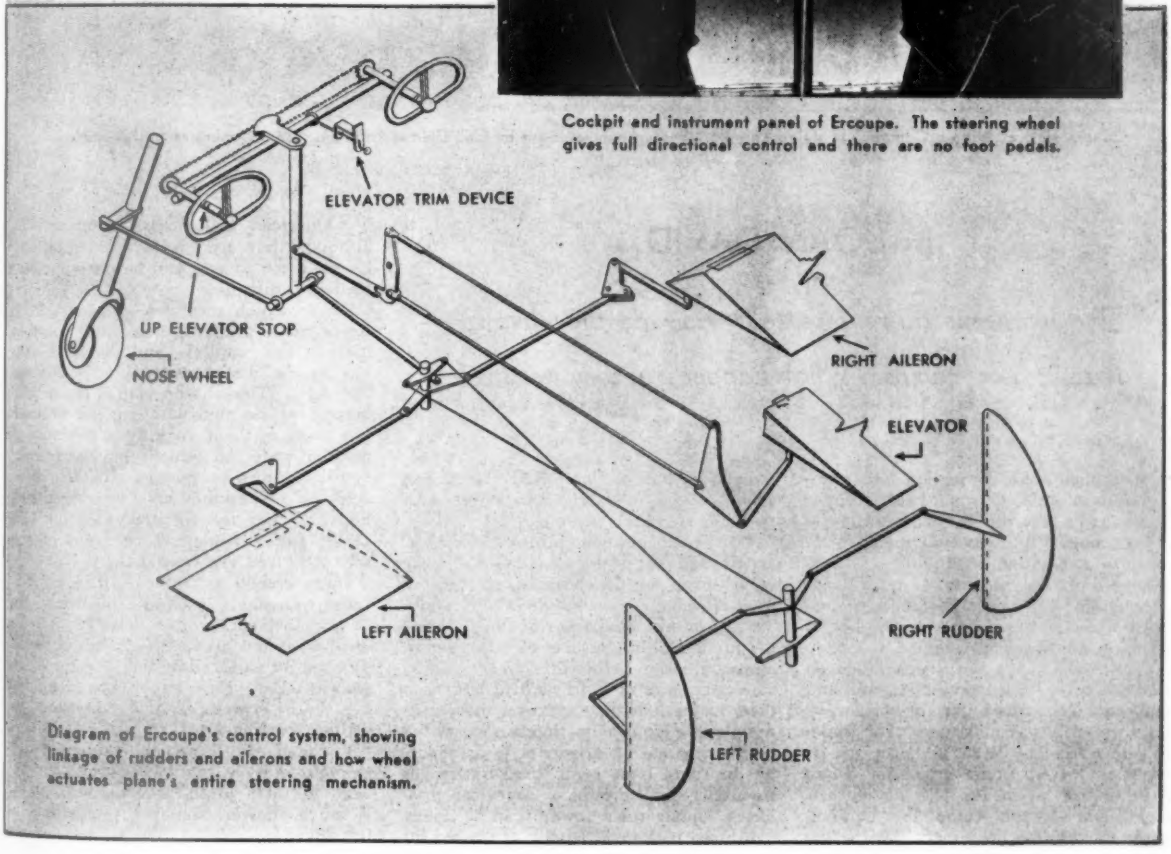


Diagram of Ercoupe's control system, showing linkage of rudders and ailerons and how wheel actuates plane's entire steering mechanism.

Our P.O.W. Captured Airmen

Camp staff at Middle Compound, Stalag Luft III. Photograph was sent by Col. Delmar T. Spivey, senior American officer there.

By JOAN DAVID

How are our airmen treated? How do they live in Nazi prison camps? What happens if they escape?

THE typical AAF combatant who parachutes safely to German-held territory is usually received by a committee of at least one Nazi, heavily armed. Thus abruptly and without formalities does he become a prisoner of war.

His captor or captors first take him to the nearest headquarters, where he is briefly questioned and stripped of money and valuables—anything which might be used as a bribe. His heavy flying suit and boots, not considered part of a military uniform, are also confiscated. For these, he gets a receipt. Then, if uninjured, he is put on a train under guard for *Dulag Luft* (abbreviation for *Durchgangsluftwaffelager*)—transit camp for aviation prisoners. Other prisoners board the train from time to time—RAF fighter and bomber pilots and crewmen, other AAF captives, a couple of Poles.

Men with serious injuries, such as burns and surgical cases, have already been taken to the hospital, or *lazaret*. Men who have been blinded, lost an arm or leg, or are otherwise obviously unfit for further military service, may request an examination before a medical commission composed of both neutral and German doctors. If they approve, those men are eligible for repatriation as soon as the next exchange of prisoners is arranged. So far there have been three exchanges involving small groups of American prisoners, among them fewer than 30 flyers.

Injured prisoners usually are cared for by American and British doctors who, although they are "protected personnel," have elected to stay and help their countrymen rather than apply for the repatriation to which they are entitled. Prisoners must prepare their own food in most of the hospitals, and the food usually is the weekly-issued U. S. Invalid Package. Those who can't move are helped by the men who can get around. For many of them, cooking is confined to heating water to which they add their bouillon cubes or powdered coffee concentrate. When they have recovered sufficiently, they too are processed through *Dulag Luft*. About 50 per cent of the men captured are wounded.

Upon arrival at *Dulag Luft*, a pilot is taken to a small, isolated camp where he is quarantined for questioning. All he need do is tell his name, rank and serial number, although additional questions are always asked. He is kept at the questioning center a week or more, at times in solitary confinement.

For men who have been injured badly enough to have required hospitalization first, the stay at the questioning center is much shorter; sometimes less than a full day.

These are the known prisoner-of-war camps in Germany. Location of Stalags Luft II and V are not known.

When a pilot gets back to the main camp at *Dulag Luft*, he is issued an American-supplied capture parcel — a lightweight metal suitcase containing underwear, socks, pajamas, soap, shaving equipment, a toothbrush and tobacco. At that point he probably hasn't been able to change his clothes for almost two weeks. His uniform may still be wearable but if it is winter he badly needs an overcoat because his flying suit will have been confiscated. British and American air officers, who do most of the administrative work in the camp, supply this from their stock of GI and RAF clothing. Men with torn uniforms get new ones. At times, Americans have to take RAF uniforms and vice versa. Allied raids often leave the camp without supplies by disrupting transport.

The same day that his clothes are stamped with a large "K" on the back (for *Kriegsgefangenen*—captured in battle), the prisoner is given a capture card. He has to fill it out in duplicate with his name, serial number and various vital statistics. One copy goes to the International Red Cross at Geneva, which in turn notifies the War Department. Occasionally it takes but a few weeks from the time his folks were told he was missing

Packed in fibre suitcase, American Red Cross "capture parcel" contains toothbrush, one tin of toothpowder, safety razor, three packages of razor blades, shaving stick, six cakes of toilet soap, two bars of laundry soap, vitamin tablets, bandages, cascara, carton of cigarets, pipe, pipe cleaners, three packages of smoking tobacco, chewing gum, clothes brush, shoe cloth, shoe laces, shoe polish, sewing kit, two bath towels, two face towels, comb and cover, sweater, four handkerchiefs, pajamas, two pairs of socks, light undershirt, light drawers, bedroom slippers.

Text explains that scrip is worth one mark and is legal tender only in special camp stores.

in action, till they get another telegram saying he is a prisoner of war. Since the invasion, however, the War Department estimates three months will elapse before notices are received through Geneva.

Men are assigned to permanent camps and shipped out every day. *Dulag Luft* processes about 1,800 a month. Population varies from a low of 30 to a high of 350. Some men stay there more than a month. Most are transferred in about three weeks. Another unusual fact: 70 per cent of the prisoners have been forced down in daylight, 10 per cent in night raids.

While no detailed figures can be made public at this time on the ratio of escapes and deaths to captures, the statistics released after the big Allied raid on Schweinfurt last October give a clue. On that mission the U. S. lost 69 *Fortresses* and over 500 airmen. The War Department declared that "on the basis of past experience" at least half of the men reported missing would turn up in German prison camps. Further figures were given out in December. At that time 346 of the 541 missing airmen had been reported prisoners.

Typical permanent air prison camp is *Stalag Luft III*. Before going, men are lectured by the ranking American officer at the transition camp on the various rights of a prisoner of war and the rules he must obey. Most interesting subject is escape.

Excerpt from a lecture reported by a prisoner at *Dulag Luft:*

"All of you will think of escaping. Many of you will probably try it. Probably none of you will succeed. If you do try, remember this. The arresting guard can fire on a resisting escapee just as he would on a criminal. If you are challenged, stop immediately. The usual punishment for attempted escape is 15 to 30 days solitary with an hour a day for outdoor exercise."

The purported "murder" by the Gestapo of some 50 RAF boys who escaped from *Stalag Luft III* last March has yet to be explained. Since the men apparently did not resist arrest, they should have been returned to their camp and their Luftwaffe guards for punishment. Aviators are noted for attempting escapes and the report of a Red Cross delegate who visited the camp last November seemed to indicate that the prison commander at least was not at fault.

"Morale," said the Red Cross investigator, "is very good. Discipline is rather strict. The camp commander says it is right that prisoners should try to escape but that it is his job to prevent them. It is rather like a game."

Dulag Luft, the transitional camp, like the permanent camps to which captured airmen are eventually assigned, is under the control of the *Luftwaffe*. Even when groups of aviators are assigned to regular camps they are separated from other prisoners by barbed wire barriers and have *Luftwaffe* guards. There is a widespread feeling that they are treated better by the *Luftwaffe* than other prisoners are by the German military. The difference, however, seems confined to intangibles, to attitudes, courtesies extended, and to the human element. Aviators are handled with respect.

During June, *Dulag Luft* was moved from Frankfurt to Wetzlar in the Klosterwald. Reasons, of course, were not given but there had been numerous protests objecting to the Frankfurt location as too exposed and in a region which was filled with military objectives. However, the small questioning center at Oberwesel, just outside Frankfurt, is apparently still being used.

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A poker game at Stalag Luft III. Another popular indoor sport is organized discussion, which has grown into regular courses.

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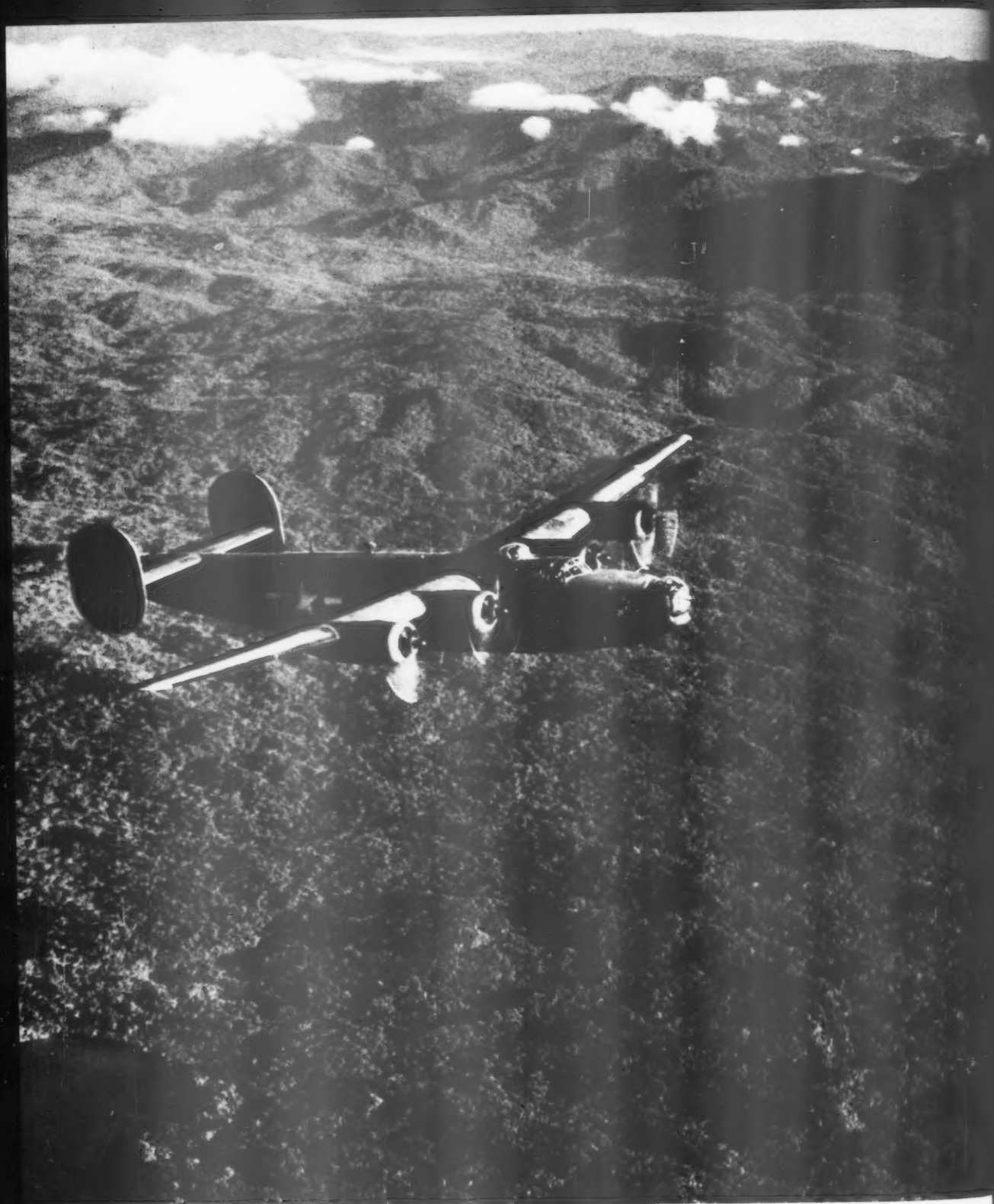
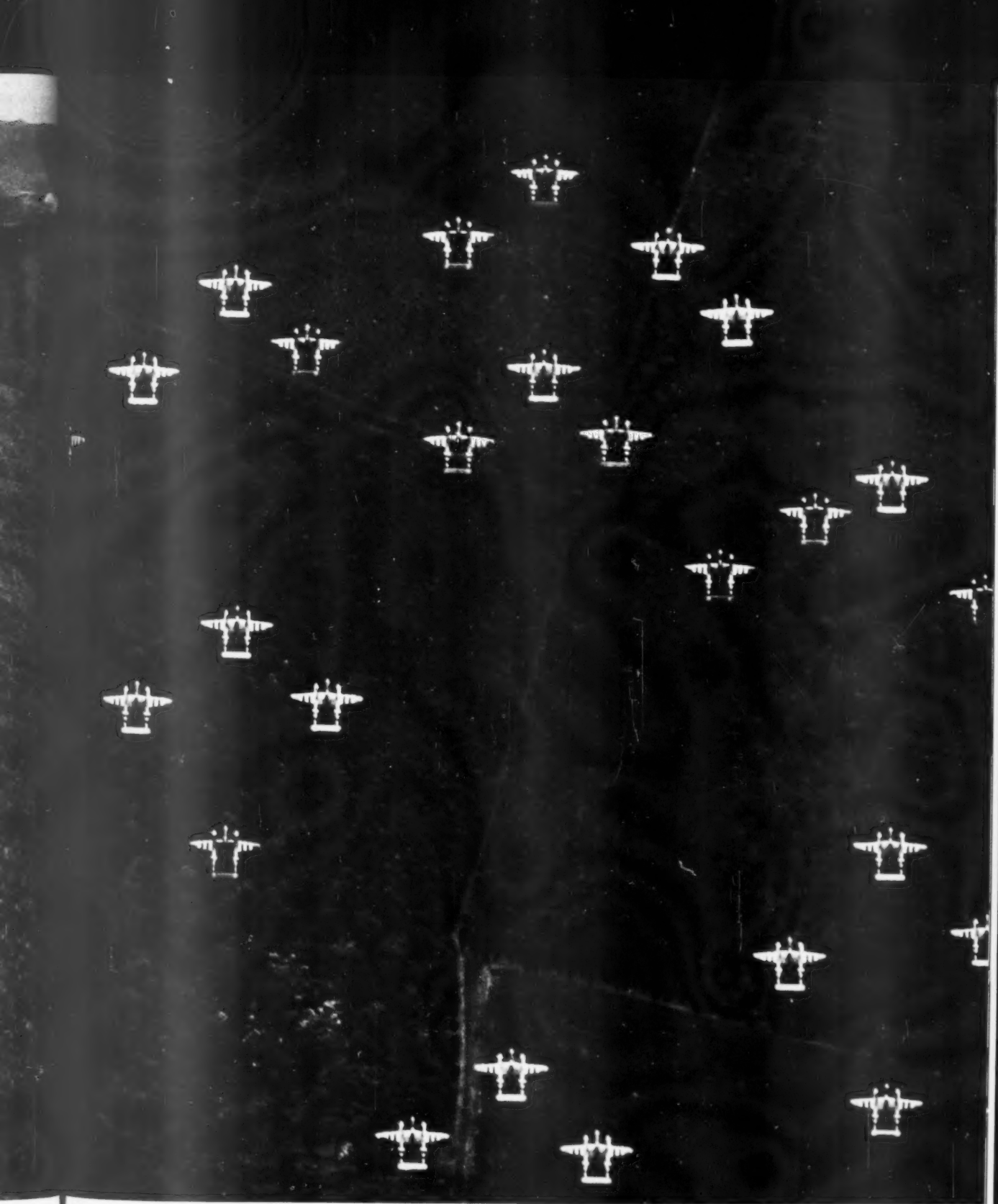
the Month's Best



SOUTH PACIFIC SEARCH



D-DAY PATTERN

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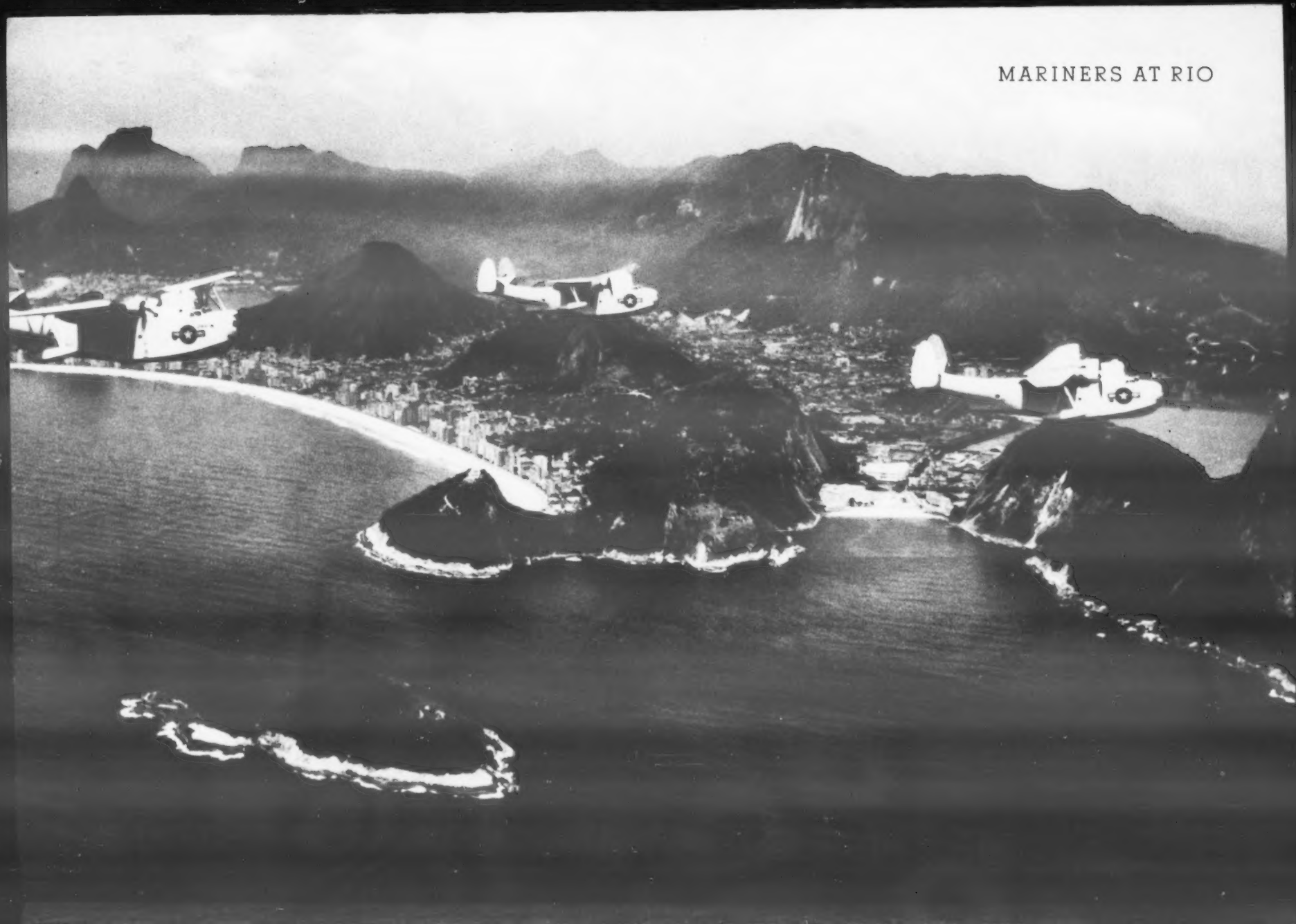
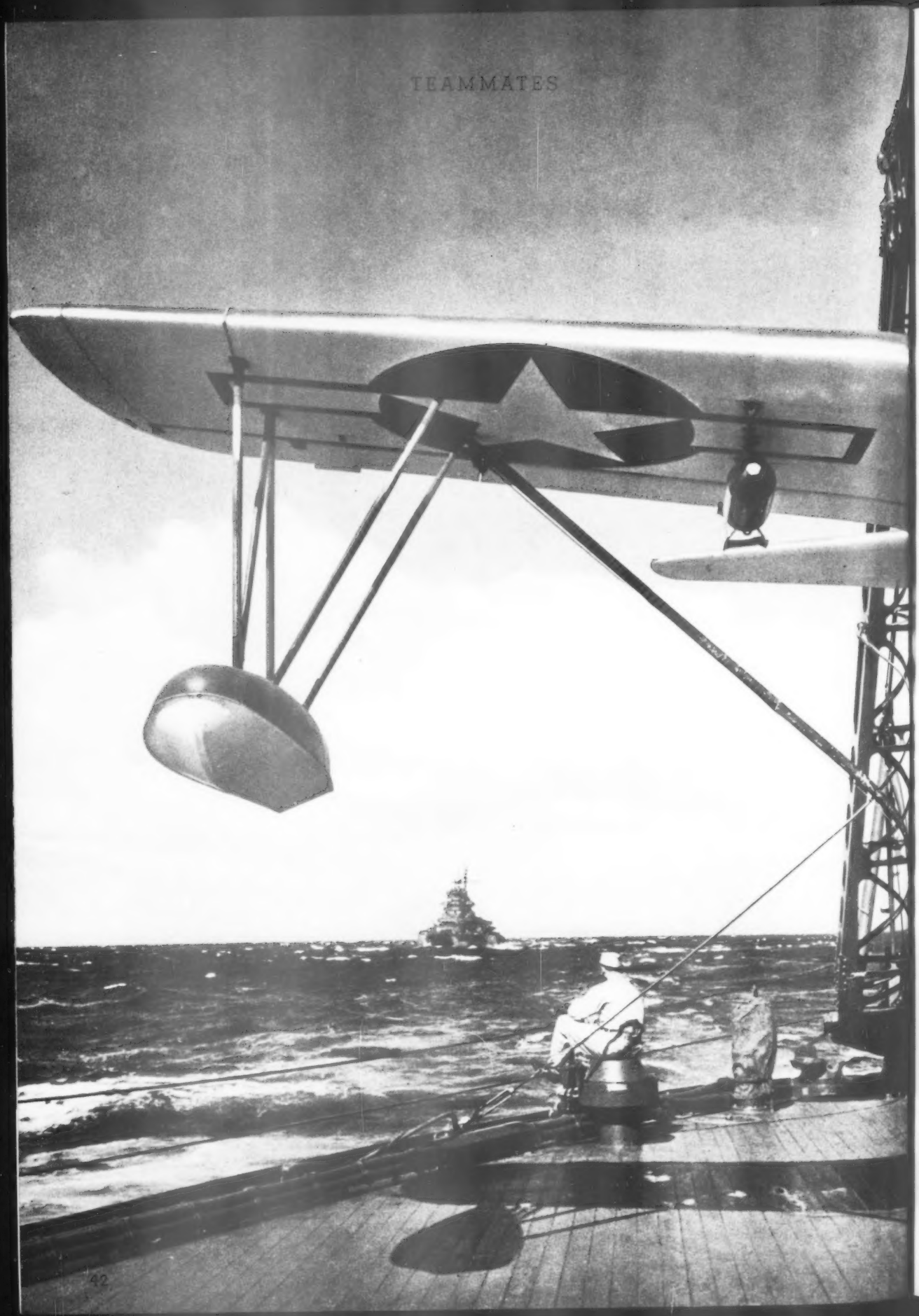
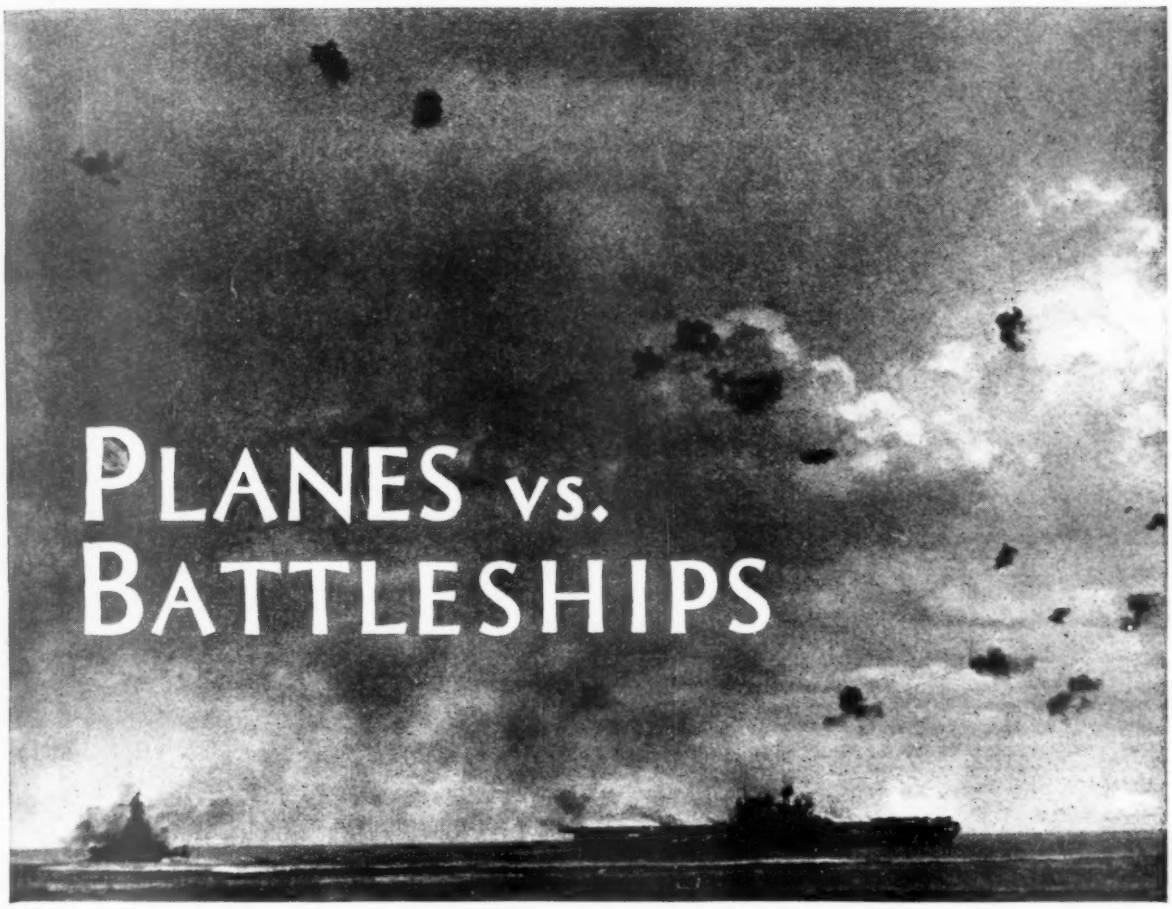


MARINERS AT RIO

TURNING HOME





PLANES vs. BATTLESHIPS

The battleship South Dakota and the carrier Enterprise guarded each other in Battle of Vera Cruz and together downed 65 Jap planes.

By JOSEPH A. BORS

Washington War News Editor, International News Service

Task force teamwork precludes a clear-cut contest between air and sea power. Each must work with the other, each is vulnerable without the other.

ON a peaceful afternoon in July nearly a quarter century ago, United States Army bombers roared over the Atlantic 60 miles off the Virginia Capes and in 25 minutes sent to the bottom the one-time German battleship *Ostfriesland* with 2,000-pound bombs.

The incident was hailed by some military and naval experts as the explosion "that will be heard around the world." The outcome was the answer of Brig. Gen. William "Billy" Mitchell to the controversy over whether modern battleships can be sunk by air power alone.

The test was made on July 21, 1921, and newspapermen reported that six Martin bombers, each carrying a 2,000-pound TNT missile, disposed of the ship that once was the pride of the German navy. The battleship was out of sight below the sea when a seventh plane, a Handley-Page, zoomed in for the attack.

Now, 23 years later, with American land, sea and air forces fighting around the world in the greatest war in history, conservative military and naval leaders assert that there still has been no clear-cut air victory over a *modern* battleship.

Japanese carrier-based planes reopened the controversy when they sneaked over Pearl Harbor December 7, 1941, and left eight American battleships in various stages of destruction or damage.

The surprise attack immobilized the major striking force of America's Pacific fleet. Sea-minded Navy men argued that we were not at war at the time and pointed out that had we been, these ships would not have been "sitting ducks" for Jap torpedoes and bombs.

By striking only at America's old battleships, the Japanese sowed the seeds for their own defeat. Subsequent events disclosed that the crippling of the battle line forced the United States to rely on the aircraft carriers which later led the mightiest naval task forces ever assembled.

After Pearl Harbor, Naval ordnance experts redoubled their efforts to make new battleships of the 35,000-ton *South Dakota* type and the still greater *Iowa* class less vulnerable to air attack by the installation of more antiaircraft guns in multiple positions.

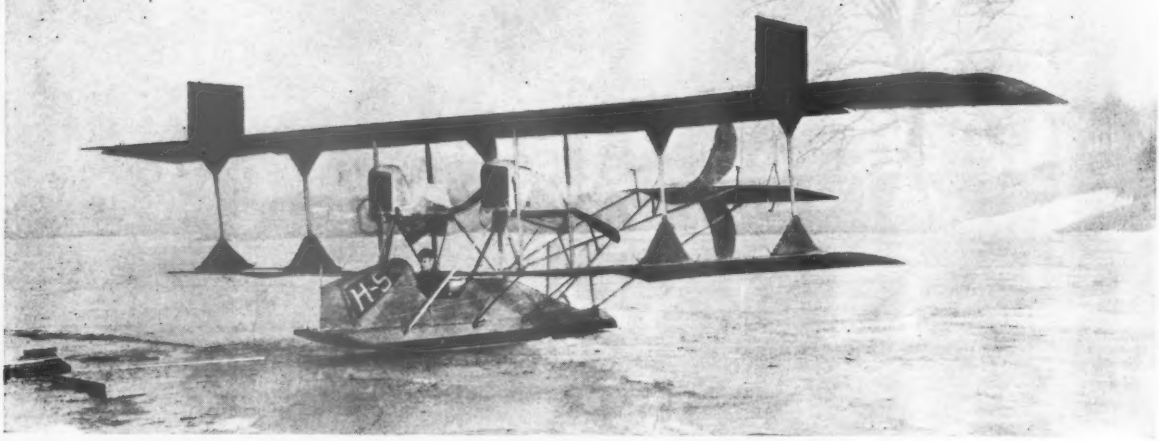
Meanwhile the Army Air Forces inadvertently re-entered the old controversy when Capt. Colin Kelly, a *Flying Fortress* pilot, met his death in a blaze of glory while "sinking" a Jap battleship off the Philippines. On December 11, 1941, the War Department issued Communique No. 3, which said, in part:

"The Commanding General, Far Eastern Command, confirms the sinking of a 29,000-ton Japanese battleship yesterday by the American Army Air Forces north of Luzon. This battleship is believed to be the 29,000-ton *Haruna*, or a vessel of the *Haruna* class."

Naval officers did not deprecate Kelly's heroism and they declined to comment officially, but they remained skeptical about the fact that the *Haruna* actually was sunk in the encounter. Most of Kelly's crew bailed out of the stricken bomber

(*Continued on page 94*)

The FIRST ROBOT BOMBER



Modisette "Hot Shot," the first pilotless bomber, had self-operated flight controls, bomb releases, and scuttling devices.

By GAITHER LITTRELL
Western Editor of FLYING

U. S. robot bomber, built too late for use in First World War, pioneered many features of the German pilotless bomb and possessed some not yet exploited.

When bomb bays opened on the Modisette plane, wings were automatically jettisoned. This prevented re-use by the enemy and added to "psychological effect."

EXPERIMENTAL work on radio-controlled bomber planes is being carried on by technical experts of every major nation in the world today. But self-propelled, pilotless, automatically-disintegrating planes were developed and flown in the United States 28 years ago!

To Robert Modisette, technical expert and chief of the contract termination group at Consolidated Vultee Aircraft Corporation, Vultee Field Division, Downey, Calif., there is nothing new in the theory of airplanes of the self-flying type, except radio. For it was Modisette who, back in 1916, built and flew what is believed to be the first plane of that kind.

Modisette developed the self-flying plane when he was vice president of the Mullin Manufacturing Company of Salem, O. The Mullin concern, which is still on the New York Stock Exchange and currently engaged in building parts for truck bodies, was producing boats, automobile bodies and airplane parts before World War I.

"It was my belief at that time that airplanes had an extremely important future in military usage, so we started designing them," Modisette relates. "We were especially interested in producing training planes for would-be pilots—at that time there was nothing but the finished combat plane."

Mullin's first venture in this new field was a training aid that resembles the present day Link Trainer. Next came an advanced "semi-flying" trainer that could rise only six feet off the ground. Finally they developed a full-sized, twin-engined biplane that really could get up in the air and cruise for miles.

It was from this plane that the self-flying bomber was developed.

Four such pilotless planes were loaded with practice bombs, flown to their targets, and disintegrated by release of the bomb load in an exhibition staged for United States Navy officers in July, August and September of 1917. Success of the demonstrations resulted in preliminary negotiations of the Mullin company with the Navy for mass production. The Armistice put a stop to the project however.

Modisette, whose inventive talent has currently been put to use by Consolidated Vultee in following up suggestions made by employees for a speed-up in producing *Liberator* bombers and other projects, became a Navy flyer at the time his self-

flying plane was first developed and demonstrated for the Navy.

He called his bomber creation the "Hot Shot." The "Hot Shot" was built of scrap spruce, rejected airplane cloth and dope at a total cost of $452. Its prototype, the orthodox trainer regularly sold by the Mullins firm to pilots and flying schools, had cost $2,450 to build nearly two years earlier.

The "Hot Shot" had a wingspread of 46 feet and measured 19 ft. 8 in. from nose to tail. Unloaded, it weighed 1,790 pounds and carried three bombs weighing 65 pounds each. It was powered with two Ford automobile engines that mechanics had "hopped up." It had a maximum speed of 72 m.p.h. at a ceiling of 1,500 feet. Cruising range was 160 miles.

Robert Modisette, creator of first robot bomber, now a Consolidated Vultee official.

When the plane released its bombs, it fell apart in mid-air and hurtled in pieces down upon what would be enemy troops. This disintegration was planned so that the enemy could not reload it and send bombs back to the owners.

The principle of the plane is explained by Modisette as follows:

An exhaust turbo and air impeller were connected to the exhaust ports of the engines on the same shaft. The turbo was turned by the force of the exhaust. From the impeller, the air was forced into an accumulator and through this to a pendulum air and relief valve and, when the air line was open, through this pendulum air valve to an air rotor.

A worm was cut directly into the end of the air rotor shaft. The worm gear meshing with the worm reduced the speed of the actuating screw. A thread was cut on the worm gear shaft which went through a swiveling unit attached to the end of each aileron, thus the function of the pendulum air valve in opening or shutting off the air line acted upon the aileron; under all conditions the pendulum air valve remained in a position perpendicular to the surface of the earth —despite the airplane's banking to port or starboard.

When the "Hot Shot" banked, the air valve opened and, through the air rotor, the action of the worm drive automatically forced the ailerons into a position which brought the ship back into level flight.

The take-off, climb and leveling-off processes were equally simple.

From the accumulator, an air line was run to the elevator and to the bomb release gear. Before the take-off, the elevator was set and locked in a position so that the bomber would gain a given altitude in a pre-determined length of time. A mechanical timing device actuated by an air valve was attached to the air lines and, when the plane reached its altitude, the timing device opened the air valve which forced the geared elevator into a position bringing the airplane into level flight.

The timing for the bomb release gear was set so that upon elapse of a given time interval the bomber theoretically was over the target area, the distance of which had been carefully estimated. At that moment an air valve tripped the bomb release mechanism, the bomb bay doors were forced open and the bombs were released.

The bomb bay doors were connected by wires to three pins in each wing, upper and lower, port and starboard. These pins were placed in joints which joined the center sections and outer wings together. The opening of the bomb bay doors pulled the pins out of their fittings, the wings folded upward, and the airplane hurtled earthward like a disjointed goose, following its bombs down upon a startled enemy—a theoretical enemy, that is.

On one of the four tests for the Navy, Modisette said the timing mechanism—which he described as "nothing more than an accurate clock with a few improvisations"—was set for a 90-mile flight. The target was not hit squarely because of an unexpected change in wind, but bombs—and the plane—fell in "the general area," the designer declared.

Naval tests, in 1918, established plane's ability to drop bombs, then destroy itself.

The other three demonstrations were more successful because of the shorter distances and "were almost right on the the bull's eye," he claims.

Today, scientists are expending tens of thousands of dollars to perfect remote-controlled bombing planes. Modisette firmly, but modestly, believes that some consideration might be given to the theory he and the Mullin company put in practice 28 years ago, now that scientific developments are advanced to make his principle even more simple and inexpensive.

Since the jet bomb, most unorthodox of Nazi war weapons, is little more than a winged, long-range artillery shell, Modisette's argument seems to have point. Inaccuracy of the jet bomb might well be circumvented through radio control of a pilotless bomber. END

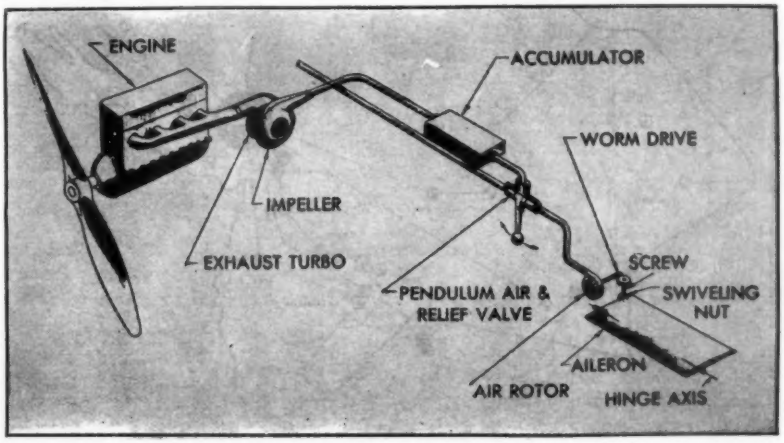


Diagram showing simple operation of the forced air system which controlled ailerons, keeping bomber in level flight. Timing gear caused elevators to level plane off at desired altitude.

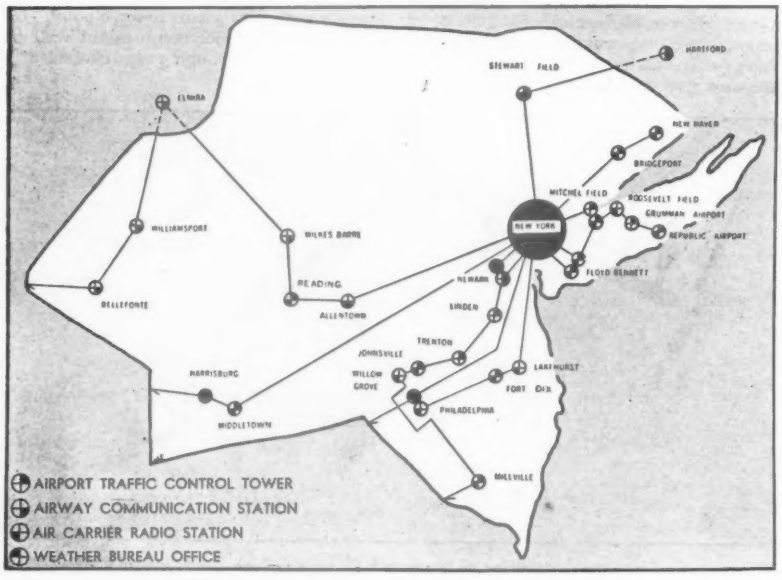
Air Traffic Control Limitations

Air Traffic control tower. The use of voice for radio communication is limited in accuracy and to the speed it can be copied.

Glen Gilbert has been with the Civil Aeronautics Administration for eight years, has been chief of the Air Traffic Control Division for the past three. He participated in the early development of airway traffic control when it was first conceived in 1935, and opened the Chicago Airway Traffic Control Center, one of the three original airway traffic control centers established by the airlines. This article is based on Mr. Gilbert's book, "Air Traffic Control," to be published by Ziff-Davis this fall.

By GLEN A. GILBERT

The six limitations of ground and air-ground communication, procedure, personnel, flight data posting and flight data interchange must be solved for fullest use of air transport.



Telephone communications between New York ATCC and ATC units of New York area.

THE basic purpose of air traffic control is the same as that of surface vehicle traffic control—protection of life and property by avoidance of collision. In the United States and Canada air traffic control has been developed as one basic system. This system is now being extended into Alaska to provide one uniform system of air traffic control for the entire North American continent north of the United States-Mexican border.

Little or no air traffic control is exercised in Central and South America except by infrequent airport traffic control towers. In Europe, a system of air traffic control was developed before the war which provided a certain amount of protection from collision, mainly to aircraft approaching to and departing from a landing area. The present English system of flying control provided by the Royal Air Force probably is the most highly developed system existing in any military theater of operation.

This article will deal with the limitations of the United States air traffic control system with respect to peacetime requirements. By analyzing the limitations of the present system from this stand-

point, a basis will be provided on which necessary improvements can be determined and plans can be made to meet the needs for controlling air traffic of the future.

In determining the limitations of the present air traffic control system, standards must be considered against which the effectiveness of the system is measured. At first glance it might be thought that safety is the standard which would indicate these limitations. However, safety can always be provided by air traffic control merely by limiting the movement of aircraft. Carried to absurdity, air traffic control, upon being advised of the approach of restricted visibility and lowering ceilings, could ground all aircraft and thereafter permit but a single plane to move in any one section of the country. No collisions could occur and safety of the highest possible order would be provided insofar as the air traffic control system is concerned.

The insurance of safety, therefore, cannot be the standard for judging the performance of air traffic control. Safety must be provided at all times. The standard of judgment must be based upon the *efficiency* with which traffic is safely guided.

Assuming that air traffic control does not prevent any flight from taking to the air or remaining in it, there are several possible standards for judging its efficiency. In ascending order of difficulty in achievement, these are:

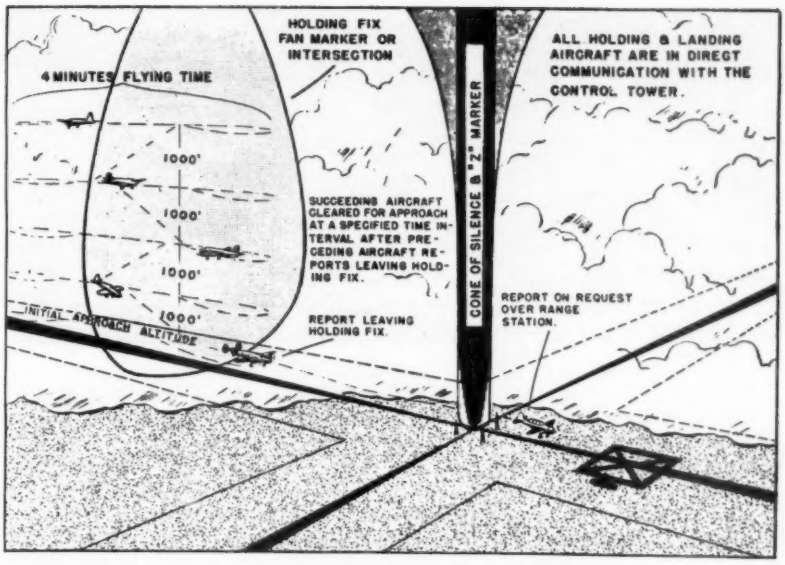
1. Safe landing of all aircraft at any available point at any time.
2. Safe landing of all aircraft at intended destination at any time.
3. Safe landing of all aircraft at intended destination in scheduled or normal flight time, within reasonable limits.
4. Safe landing of all aircraft at intended destination exactly on schedule, or in normal flight time.

Somewhat comparable in the way of expectations, would be the following imaginary advertisements:

1. "*Santa Maria.* Sailing west. Expect to sight some land in 1492 or 1493."
2. "*Mayflower.* Leaving for Plymouth Rock. Probable arrival 1620."
3. "*Trader Horn.* To the Indies. Departs Falmouth May 18, 1851. Arriving Calcutta August or September."
4. "*Queen Mary.* Leave Southhampton 6 p.m., July 14. Arrive New York 7 a.m., July 19."

The time is past when the airplane user is satisfied with arrival, whole and entire, someplace, sometime. He may now be grateful but he is not satisfied. Just as users of other methods of transportation grew more exacting as the industry advanced, so do the airplane passenger and shipper become less and less tolerant of disappointments and delays. Growth of air transportation requires that facilities and services used by it must advance, keeping pace with the demands of passengers and shippers. Air traffic control must, therefore, provide a continually rising standard of efficiency.

The present standard of efficiency may be said to be somewhere between Standard No. 1 and Standard No. 2. During the next few years it is believed that the standard of control efficiency must rise to No. 3. Air traffic control must be prepared to meet this standard or take the responsibility for retarding the development of air transportation. The highest standard, No. 4—safe landing of all aircraft at intended destination exactly on schedule, or in normal flight time—must be closely approached before air transportation can become fully mature. It can be expected that this standard will be demanded by the traveling public and the shippers as air transportation develops in the post-war era. To satisfy this demand, air traffic control delay will have to become a rare occurrence rather than the commonplace it is today.

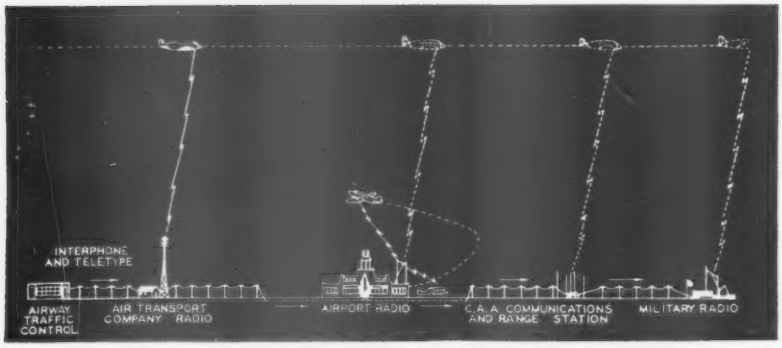

HOLDING FIX
FAN MARKER OR
INTERSECTION
4 MINUTES FLYING TIME
1000'
1000'
1000'
1000'
INITIAL APPROACH ALTITUDE
SUCCEEDING AIRCRAFT CLEARED FOR APPROACH AT A SPECIFIED TIME INTERVAL AFTER PRECEDING AIRCRAFT REPORTS LEAVING HOLDING FIX.
REPORT LEAVING HOLDING FIX.
CONE OF SILENCE & "Z" MARKER
ALL HOLDING & LANDING AIRCRAFT ARE IN DIRECT COMMUNICATION WITH THE CONTROL TOWER.
REPORT ON REQUEST OVER RANGE STATION.

When aircraft can make a "straight in" approach from a holding fix on the approach leg of the range, landing intervals can be cut to five minutes from usual 10 to 12.

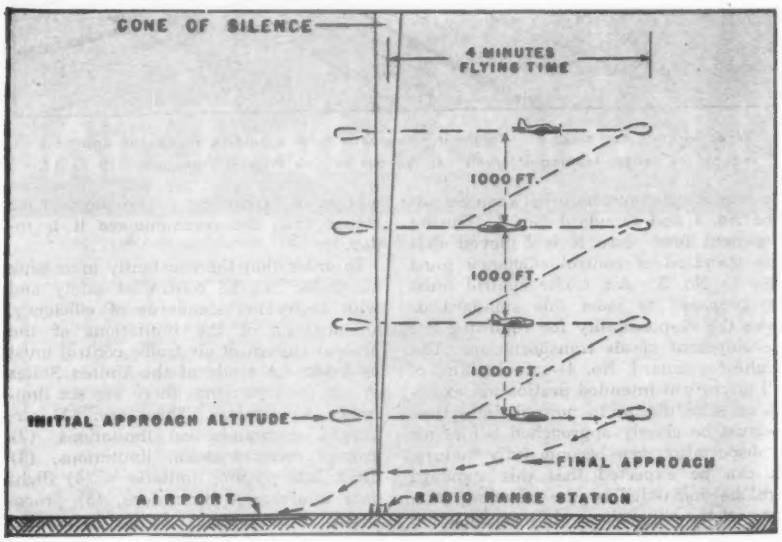
In order that the constantly increasing air traffic can be controlled safely and with increasing standards of efficiency, an analysis of the limitations of the present system of air traffic control must be made. A study of the United States system indicates that there are six limitations to consider. These are: (1) air-ground communication limitations, (2) ground communication limitations, (3) flight data posting limitations, (4) flight data interchange limitations, (5) procedural limitations, and (6) personnel limitations.

Air-ground communication in the

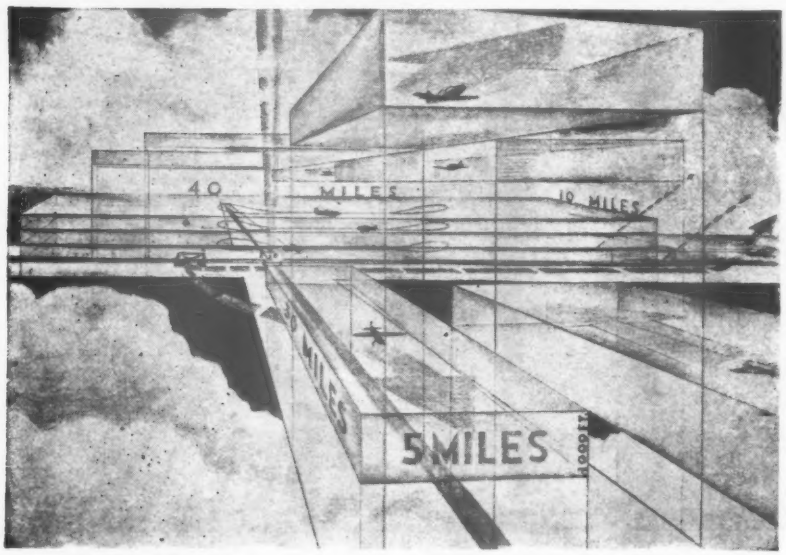
Increasing work load and time required to handle flight data, plus obscurement of data and crowding by personnel, causes lag in data and threatens loss of efficiency.



CAA messages must go through various types of circuits. In poor weather conditions, the voice message must often be repeated. Thus there are many possibilities of error.



In instrument weather, aircraft must be stacked over or near the range station at intervals of 1,000 feet, and landings must be made in slow, orderly succession.



When visibility is less than one mile, each plane is operated in a reserved, constantly moving air block, about 30 miles long, five miles wide and 1,000 feet high.

United States is carried on through Civil Aeronautics Administration radio range facilities, air-carrier company radio stations, airport traffic control towers and military radio facilities. Since there is only a limited number of frequencies available for each type of facility, increasing air traffic activity has resulted in frequent confusion and interference during peak traffic conditions and especially during instrument weather conditions when a large volume of air-ground communications is necessary to handle important messages.

These difficulties will be further accentuated when the air traffic pattern within the United States is expanded to meet increasing demands for air transportation. For example, it has been estimated that in the post-war period scheduled air transportation will be required at approximately 850 air stations, an increase of over three times the present air carrier service.

To provide for protection against collisions between aircraft under such an expanded air traffic pattern, it seems inevitable that air traffic control will eventually be required over all air space of the continental United States. Before the control of all air space can become an actuality, many more ground radio stations will be necessary—a problem which also involves additional frequencies in the already-crowded aviation radio channels.

The use of voice as a means of radio communication for the control of air traffic leaves much to be desired. To be dependable and for the greatest accuracy, the person receiving a message by voice radio must copy it verbatim, which limits the possible speed of transmission to the rate at which the message can be written. In poor atmospheric conditions the voice may become unintelligible, requiring that the message be repeated several times. This impairs accuracy and introduces many possibilities of error. In addition, the receipt and transmission of voice radio messages require considerable time and attention on the part of the pilot or co-pilot, thus detracting from time the flight crew can devote to flight and navigation problems, often at critical moments.

Efficient utilization of the air-ground communication facilities for air traffic control purposes is dependent upon the availability of adequate ground communication facilities connecting each airway traffic control center with ground radio stations in its area. At the present time this is accomplished by means of teletype and interphone (leased telephone lines). The teletype facilities are used primarily for the handling of movement messages (flight plans, progress reports and arrival messages) and the interphone facilities are used primarily for control messages (traffic clearances and control instructions).

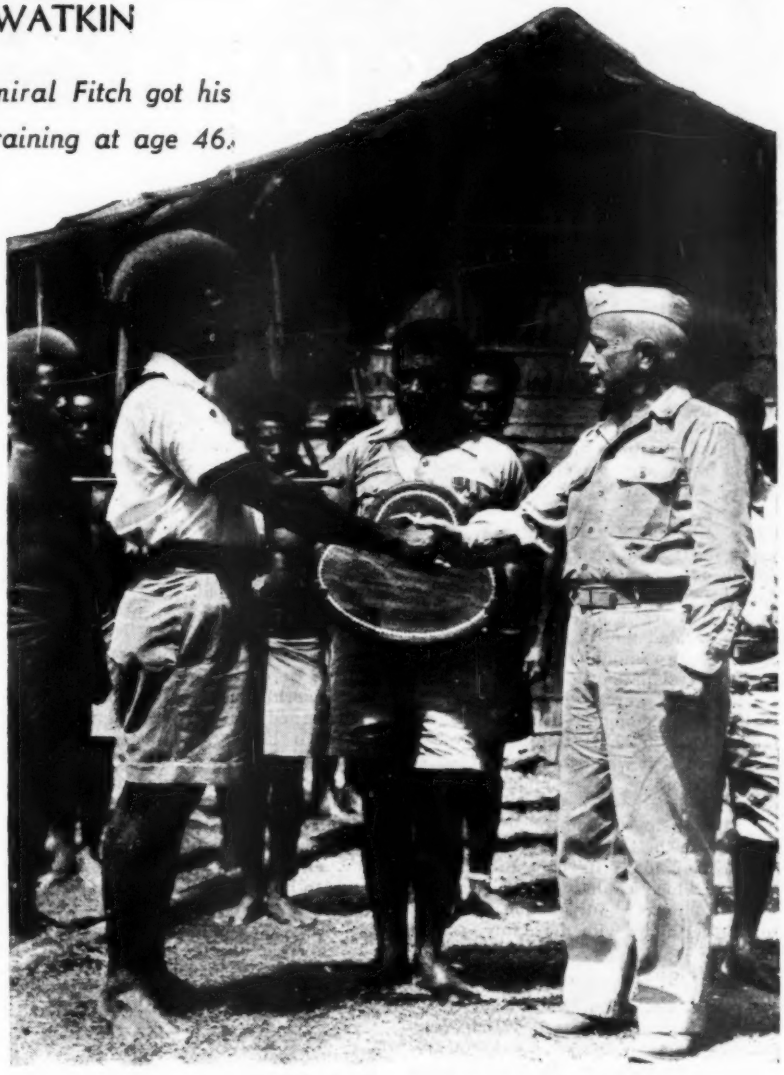
Increases in air traffic and resultant increased air-ground facilities mean that teletype and interphone facilities must be correspondingly increased. However, relay of messages by manual methods and the handling of messages in airway traffic control centers by various numbers

(*Continued on page* 100)

The GRAY-HAIRED ENSIGN

By LAWRENCE E. WATKIN

New Navy air boss, Vice Admiral Fitch got his nickname when he took flight training at age 46.



Vice Admiral Fitch receives plaque from Solomon Islanders. The sergeant holding the plaque lived after being tied to a tree by Japs and used for bayonet practice.

VICE ADMIRAL AUBREY WRAY FITCH, the Navy's new Deputy Chief of Naval Operations for Air, is the least publicized of all the important military men fighting this war. There is sound reason for this. Since that Monday morning, December 8, 1941, when he started out after the Japs, he has kept his face to the foe, his back to the camera. He went from sea-air commands, where security shrouded all fleet actions, to the depths of the Solomons Islands in which reporters and cameramen do not abound. Nor is he the sort of man, either in peace or war, to blow his horn.

Navy circles, better informed, respect him. Except for Admiral King, 61-year-old Admiral Fitch has the longest sea duty record of any admiral on the active list. His well-rounded career includes experience as gunnery officer on the battleship *Wyoming* during the first World War, the command of three different seagoing task forces during this one, and the delicate administrative feat of co-ordinating Army, Navy, Marine, and New Zealand flyers throughout the long and difficult Solomons campaign he has just wound up. What's more, Admiral Fitch is a real flyer himself. When he earned his wings at Pensacola Naval Air Station 15 years ago, nobody expected the 46-year-old skipper of the *Lex* to take off from the old carrier-trainer *Langley*, much less land back on her. But if the kids could do it so could he, and he did! They still call him the "Gray-Haired Ensign."

The No. 1 boss of Naval aviation wears his honors lightly. Secretary of the Navy Forrestal, introducing Admiral Fitch in Washington, mentioned that he had participated in the Battle of the Coral Sea. "Yes," said the admiral, "I had the honor of being sunk in that engagement."

The admiral never attitudinizes, never rants. But a few moments before the *Lexington* blew up and sank, when his orderly, in deference to his age suggested that Admiral Fitch slide down the rope first, it was given to that young man to hear words that blister and burn. "Look," said one of the officers who has been with him for years, "I've only seen the Old Man blow up twice. When that happens, I don't want to be in his way."

Jake Fitch's most recent triumph is the strategy behind the Solomons campaign, which the newspapers have never reported properly to the nation at large. At his command headquarters in the South Pacific there was not a single newspaper or publicity man. Though not allergic to the press, he went on the modest assumption that if he did his part that was all that mattered.

The story of that campaign is still to be told. The accomplishment of those South Pacific flyers under the leadership of Admiral Fitch is one of the most fascinating narratives of modern warfare. It had to be smart to succeed. With the decision to lick Germany first, and because Guadalcanal had been slow and costly, only a shoestring allotment was doled out to the continuing Solomons operation. Yet this handful of planes not only cut a swath all the way up from Guadalcanal to Munda to Ondonga to Barakoma to Stirling to Torokina to Green Island, but it managed to take on all the planes the Japs could send from the great supply center at Rabaul. When Rabaul was drained, the enemy flew in bombers and fighters from the nearby Carolines, and finally all that could be spared from the empire itself. The Fitch fighters knocked them all down impartially. For the nine weeks leading up to mid-February of 1944 they destroyed 863 Japanese aircraft, lost only 136. Admiral Fitch himself disclosed that between Sep-

(*Continued on page* 118)

Stanton "Resignation"

Although Charles I. Stanton, administrator of civil aeronautics, "resigned to return to my previous duties . . . as deputy administrator" in a letter to the President, actually he quit under pressure from the Department of Commerce . . . First move against him came more than six months ago. At that time he was assured by Jesse Jones that nothing would come of it, and he was reassured before he left on his trip to Spain. When he returned from Spain, however, Mr. Jones informed him that White House pressure had been brought to bear in Stanton's absence. Stanton was offered posts in private industry at a great increase in salary but turned them down on the grounds that his abilities and experience best suited him for work in CAA. It was finally decided that he should drop back to the deputy administratorship . . . His letter of resignation and the news story announcing it were both prepared in Department of Commerce, not CAA, offices. Indeed, CAA and CAB information offices first heard of it when the story appeared in the papers . . . It is understood that two major reasons were given for wanting Stanton to step down. He had not joined with the Department of Commerce high command in its opposition to the Lea Bill, which would have removed CAA from Commerce jurisdiction, and he "didn't get along with the Army."

T. P. Wright

Into this difficult situation, as Stanton's successor, steps Theodore P. Wright, with gilt-edged qualifications and the hearty respect of the industry. He has had years of experience with aviation design and production and since 1940 he has been in Government war work with headquarters in Washington. He has been the guiding genius of the nation's production program in war aircraft which took the President's challenge to produce 50,000 planes a year and doubled it . . . It is not the first time that Wright has served his country. He was an ensign in the USNR Flying Corps in the last war, become a full lieutenant in 1920, and later was superintendent of construction of Naval aircraft in the New York area . . . Returning to private life, he became chief engineer of the airplane division of the Curtiss Aeroplane and Motor Company, and in 1937 became vice-president and director of engineering of the Curtiss-Wright Corporation. Mr. Wright was born in Galesburg, Ill., and has a B.S. degree from both Lombard College, Galesburg, and M. I. T., and an honorary Doctor of Science from Knox College, Galesburg.

Smithsonian

This column's post-war victory garden, consisting of one seed planted in the July issue, seems to be bearing fruit. The seed was our proposal that somebody ought to do something about the aviation collection at Smithsonian Institution, which at present is muted, mangled and badly displayed. The impression one brings away is that we patted Wiley Post, Lindbergh and the other distance-flight boys on the back, racked up their planes and returned to contemplating the horse and buggy. Even if the offers of Army, Navy and industry to stock the Institution with history-making World War II equipment were accepted, there would be no place to put it. Here we are, the greatest nation in the world so far as aviation production is concerned, with no adequate visual record of it in that nation's archives . . . Well, it seems that Sen. Kenneth S. Wherry of Nebraska saw our remarks and promptly introduced Senate Resolution 307 to see what could be done to improve matters. Investigations are now under way and appropriate legislation toward funds to house an all-out aviation collection is expected to be forthcoming in the next few months . . . Among the other experts endorsing the plan are Maj. Gen. U. S. Grant, III, chairman of the National Capital Park and Planning Commission, which approved the Wherry resolution at a recent meeting; and Maj. Gen. Philip B. Fleming, administrator of the Federal Works Agency.

Presidential Putt-Putt

Don't look now, because it might be impolitic what with the election just around the corner, but one of our agents just gave us a ring-side description of President Roosevelt's plane which is too good to keep. We understand, incidentally, that the President has already taken delivery. It's a super-deluxe job, with a futuristic apartment complete with a row of buttons that bring every comfort and convenience to him at the touch of a finger . . . One button unfolds a work desk from the wall, another brings forth a row of chairs for visitors, a third reveals a row of enlarged navigation instruments to enable him to plot a course, and others connect with all parts of the plane . . . Equally ingenious is a rolling chair that enables the President to go practically anywhere on the plane without standing—even to the co-pilot's station, where the wheelchair is designed to replace the co-pilot's seat . . . Our man said he couldn't get any dope on how much the plane cost—its manufacturer won't confirm or deny that such a plane exists. He asked if the President had seen it but the manufacturer had a logical answer on that one, too—how could he have seen anything that officially ain't?

Tigercat

An electrician and a Navy lieutenant won a $500 war bond each over more than 2,000 rivals in the recent contest to name Grumman's F7F. The winning name was *Tigercat* . . . Perhaps more intriguing is the fact that two other men got prizes of $500 each for another name—*Bearcat*—without a plane to pin it on, indicating that Grumman must already have in the works a better-than-F7F . . . *Tigercat* winners were Arthur W. Cummings, a Grumman electrician, and Lieut. Lyle F. Stewart, USNR, officer in charge of the training aid section of the Third Naval District's training division. Bearcat winners were Frank Collinge, a Grumman clerk, and Willard Callahan, a division manager for the Avon Products Company . . . If Grumman is going to improve on the F7F—woops, the *Tigercat*—it's going to take a stick of doing according to expert testimony by Marine Capt. Fred Avey of Spokane, Wash., a veteran of 98 combat missions and more than 200 hours of combat flying, with four Jap planes to his credit, plus the air medal, a Presidential unit citation (he fought with Maj. Gregory Boyington, the Marine's famous ace), and bronze stars for action at Guadalcanal, Bougainville, the Battle of the Bismarck Sea and other Pacific combat operations. Flying the *Tigercat* on a recent furlough, he described it as "a dream plane—the answer to a pilot's prayer."

Traffic Jam

Post-war pundits who are worried about how mass air traffic is going to be handled may be relieved somewhat to know that such traffic has been moving at a great rate for some time—and with amazing efficiency. You can read about it between the lines of any war dispatch about bombing raids—thousands of planes take off in a given area in a brief space of

(*Continued on page* 142)

Engines for Private Planes

By CARL T. DOMAN
Chief Engineer, Aircooled Motors Corporation

The 190-h.p. engine in Stinson Sentinel has more power than many private planes will need, but it indicates possibilities in lightplane engine futures.

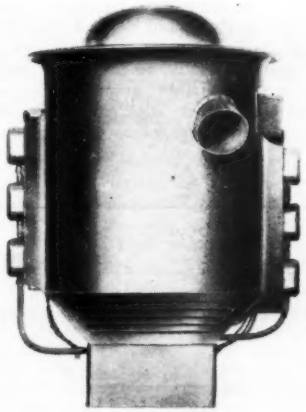
Lower private airplane costs demand standardized engines and performance.

WHAT kind of engine should the ideal personal plane have? This is one question plaguing manufacturers who are preparing for the post-war mass market. Just as the automobile industry did not attain full stature until it standardized models and settled on definite criteria of performance, so the aircraft industry must bring about public acceptance of fixed models and types of operation in order to achieve a truly mass market and lower costs. Only in this way can flying become the habit of millions instead of the privilege of thousands.

The question then becomes—what equipment shall be made standard? How can we settle on desirable performance when aircraft research produces such rapid changes? In the automobile industry, several of the large-production power plants have been used, with minor refinements, for periods of 10 years or more. The industry does not discard an engine and introduce something new every two or three years but continues to improve the original power plant.

The producers of engines for personal planes are faced with the same problem. Engine development costs are enormous. A rough estimate made in 1940 of the expenditures of three companies in building three 50-h.p. engines and preparing them for production showed that $1,000,000 had been spent. At that time it was predicted that the total production of the three companies would hardly reach 10,000 engines before the model would be superseded by a more popular 65-h.p. engine. This prediction later proved to be correct. There was thus a write-off of $100 per engine for engineering and tooling on every 50-h.p. engine produced!

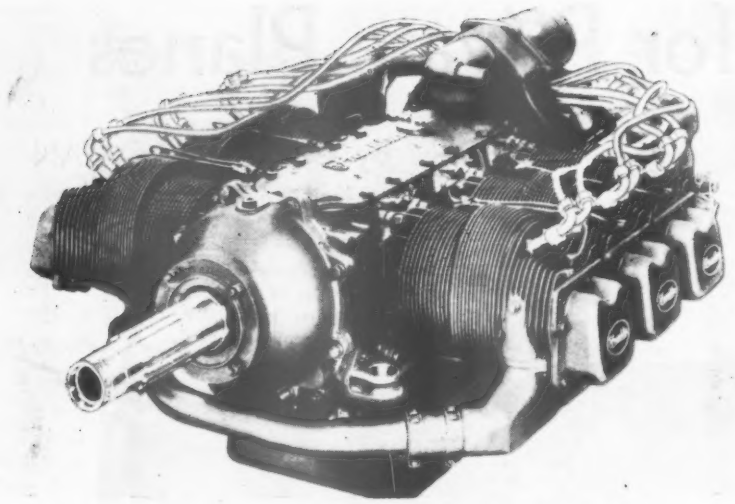
One proposal which offers some prospect for reduced engine costs is that the water-cooled automobile power plant be adapted to personal airplanes. When it becomes possible to develop a mass market for personal aircraft, some startling production prices might be attainable with such engines. In 1941, the total labor and material bill to produce one of the popular 85- to 90-h.p. automotive engines was approximately $60, including carburetor, ignition system, generator, starter and fan. This unit was built at the rate of 500,000 to 750,000 per year. Designed for an automobile, its weight was naturally excessive for aircraft use, for it weighed about 550 pounds with accessories, as against a comparable 90-h.p. airplane engine with all accessories weighing only 225 pounds.



Designed for helicopters, this six-cylinder 298-cu. in. engine develops 155 shaft-h.p.

In general, however, previous attempts to use standard auto engines in airplanes have been unsuccessful. The auto power plant must be changed in so many ways before it is acceptable for aircraft use that it winds up costing almost as much as the specialized plane power plant. Attempts at adaptation have usually ended with the cylinder block itself as the only unchanged item. Being expensive, this generally remains in cast iron, thus adding too much weight for aircraft use.

If, as engineers predict, air-cooled automobiles prove practical, there is a possibility that this type of power plant could be converted readily for the post-war personal plane. The automotive engine could incorporate overhead valves or an L-head



This lightplane engine developed by Franklin is a geared, six-cylinder-opposed model which has an overall measurement of 298 cu. in. It develops 160 h.p. at 3,200 r.p.m.

type of construction, since it is possible to build an engine with fairly high specific output for auto service in either type of valve arrangement.

The principal problem the aircraft industry will face in taking advantage of the automobile industry's mass production costs will be that of achieving interchangeability of parts, since the two industries move at different paces. There is little tendency for the automobile to demand higher output from its engines, whereas this tendency is constant in the airplane field. For example, automotive parts which operated satisfactorily in engines operating at 110 brake mean effective pressure will not do so when pressures are reached much above this figure. A composition timing gear which operated satisfactorily in engines producing 65-h.p. at 115 b.m.e.p. could not stand up when output was raised to 80-h.p. without having a metal gear facing; at 140 b.m.e.p. it was necessary to eliminate the use of composition entirely and use steel throughout.

Similar difficulties will be faced by the automotive industry in adapting its engines to the higher octane fuels available for post-war use. Aircraft experience proves that increases in compression ratios with their accompanying higher explosion pressures, must bring about radical changes in crankshaft and crankcase design. The auto industry might conceivably re-design its power plants with the idea of operating at b.m.e.p.'s approaching those used today in personal plane engines. There is a possibility that many of the parts could become interchangeable.

Among the "must" items to be included in post-war personal engine systems is a means for preventing carburetor ice, either in the form of an automatic temperature control for the air intake or the use of pressure or injection type carburetors. Another important item will be the use of a dual camshaft speed magneto of very simple design or dual battery ignition in order to achieve low-cost production costs in this field. The former would provide better high speed operation, but the latter would furnish automatic spark advance, is more easily understood by the average mechanic and can be adapted from automotive designs.

Electric or hand-starting will also be essential for the popular post-war personal plane. Prop-turning will hardly be enticing to the average customer. The pull-starter or some other manual means of operation from the cockpit should be used. If a converted automotive generator and starter could be used, they would be available at a surprisingly low cost. The generator will be necessary because of the inescapable demand for radio, lights and other electrical equipment. This indicates the value of adopting the electric starter as standard equipment.

Let us sketch out the personal plane of tomorrow, assuming our costs on the basis of 1941 dollar value. There is, first of all, a decided need for a two-passenger plane to sell, completely equipped, for $1,200. This means a production cost of not more than $600 for labor and material, of which the engine manufacturer is entitled to 50 per cent, or $300.

These costs obtain only if the engines can be put through the plant in orderly production fashion without variations and in quantities to warrant adequate tooling.

A $30 figure for accessories assumes the use of modified units from automotive production, which would not be limited by the expected increases in b.m.e.p. previously mentioned. These accessories include starter, generator, spark plugs, ignition wiring, dual battery distributor or dual magnetos and carburetor (with fuel pump if needed).

The question of costs recalls the oft-heard statement that an engine for the personal plane market can be produced for $100, weigh 100 pounds and develop 100 h.p. Analysis shows that this statement is not so much out of line as would first appear, provided the engines could be produced at the rate of 100 a day; also interpreting the $100 selling price to mean the labor and material bill of the engine manufacturer. The most difficult item to meet in the whole picture is the weight of 100 pounds. Certainly it will be many years before such a weight can be met. A weight figure of 200 pounds is more likely.

The automotive industry for years has been careless in its claims representing horsepower. In the final analysis horsepower in itself means little. As an example, a 90-h.p. automobile engine usually develops this output at 3,500 to 3,800 r.p.m., or at speeds of 70 to 75 m.p.h. The same automobile might be lacking in performance at the lower end of the speed range where power is needed for quick acceleration and climbing hills. In an airplane, if an engine is rated at 90 h.p., the owner expects that this power is available to take him off the ground, to get him out of small fields. The definition of horsepower for aircraft engines is definitely related to operating conditions which the operator experiences each day. Whenever he takes the plane off the ground he desires to use as nearly as possible the maximum rated output of the engine; whereas an automobile operator might use his car around town for months and never take out of it much more than 25 per cent of its rated output.

Unless a constant-speed propeller is used, it is impossible to take out, under climbing conditions, the rated output of the engine. Table I gives the exact performance of a popular airplane powered with a 90-h.p. engine.

This represents one specific design of airplane. If an airplane which is much cleaner and has better top speed characteristics were used, the engine would perform as shown in Table II.

This analysis shows that at take-off, although the engine is rated at 90 h.p., it delivers only 75 h.p. If a propeller is selected to let the engine develop 90 h.p. in

(*Continued on page* 106)

TABLE I

Climb r.p.m.	Horsepower during climb	Full throttle level flight r.p.m.	Full throttle level flight horsepower	Full throttle level flight speed (m.p.h.)
2400	86	2730	97	115

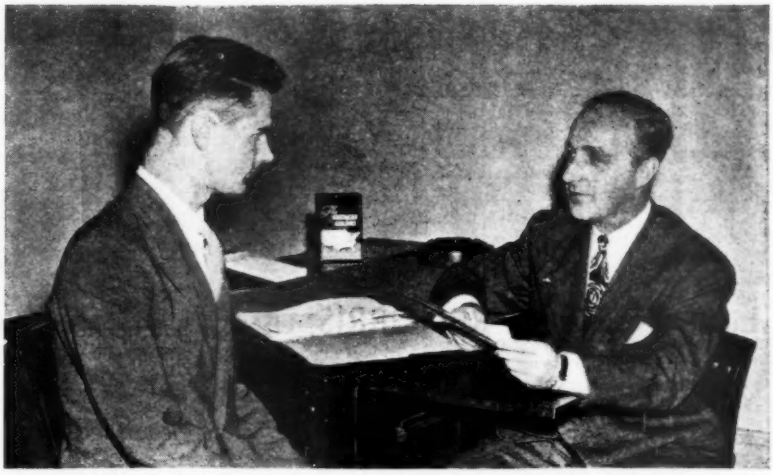
TABLE II

Climb r.p.m.	Horsepower during climb	Full throttle level flight r.p.m.	Full throttle level flight horsepower	Full throttle level flight speed (m.p.h.)
2100	75	2800	100	132

AIRLINE JOBS, Post-War

By VICTOR VERNON
Personnel Director, American Airlines, Inc.

Airline operations are due for an enormous expansion, and there will be 10 ground jobs for every one in air



Carl Wickman is interviewed for position of operations agent by E. L. DeRosa, American Airlines' central personnel director—his aviation experience got him the job.

THE problem uppermost in the minds of the boys in the military services is: "What kind of a job, if any, will I have when I get back?" In their more realistic moments this question even takes precedence over thoughts of the girls back home.

Those who had permanent jobs before they went to war are assured by law of having their old jobs back or the equivalent in "seniority, status and pay." It is doubtful, however, whether all of these boys will want their old jobs back. Furthermore, the medical discharges which they are granted by the Army and Navy do not necessarily mean that these men can meet the sometimes rigid physical standards set up by individual companies. These two points must be considered before making any generalization about post-war jobs.

First, about getting that old job back. Many of the boys in our military services were drafted in 1940. Those who were drafted then were mainly young men who had not yet made a place for themselves in the business world, whose experience was limited, and whose positions were least vital to the businesses which they left. At the same time they were the cream of the youth of the country so far as physical and mental fitness was concerned. When they got into the Army or Navy they were given a chance to show their mettle and they made the same progress they would have made in civil life and, in many instances, even greater.

These boys went in as privates. Hundreds of them will emerge as officers who know how to handle people and how to get jobs done. They went in as ordinary employees—they will emerge as qualified executives. They went in as boys—they will emerge as men. It is doubtful if such men will even want their pre-war jobs, or an equivalent. They will have gained far wider experience than most jobs would have given them had they remained at home. They will deserve better jobs than they left.

Add to this the fact that a number of these young men had not worked with any firm long enough to have a deep feeling of loyalty to that firm. Thus, while a company may be quite willing to take all of its former employees back, provided they are certified as physically fit, it is by no means certain that all of its former employees will want to come back. A recent sample poll taken by American Airlines among its men on military leave, however, disclosed that only two out of 153 were not intending to return to the company, and one of these qualified his answer. Less than 60 per cent wished to return to their former positions, however.

The question of physical fitness to resume a pre-war job is an even more delicate one. It bothers many of the boys at the front more than any other. Those who have been weeded out of the Army as physically unfit may indeed qualify for many peacetime jobs, as we have found by experience with men whose physical qualifications did not permit them to enter the service at all.

If disability is purely physical it will not be a handicap in many jobs, and American Airlines for one is very favorably disposed to hiring qualified men for jobs where mobility is not a prime factor, provided their general health is good and they are not mentally handicapped. Such positions will be open for mechanics in instrument overhaul, for example, and in other service departments where complete mobility is not essential, as well as for clerks, instructors or semi-executive jobs in any department. Some of our own most valued employees today have physical handicaps.

Having said all this, however, we have still only touched upon the fringe of the problem. Thousands of men in the armed services have no job to come back to because they had none before they left. Thousands were just out of school. Many of these have been sent back to school by either the Army or the Navy for streamlined training which will graduate them earlier than in peacetime.

So, in addition to providing jobs for men who have progressed beyond the jobs which they left, we are faced with the task of finding jobs for millions of boys whose only profession since they reached the age of 18 has been that of bearing arms. It is a tough one and in my opinion must fall primarily upon the shoulders of private industry. The point may be raised that private industry failed to meet this problem after the last war, with the result that the Government was forced to step in and provide jobs for the unemployed. However, according to statistics compiled by the National Industrial Conference Board and the American Federation of Labor, the total number of unemployed was still approximately 11 million in the early months of 1939 before the opening guns of the Second World War sent millions of men back to work. The problem was not solved by the Government either and I believe the public will insist that private industry take the initiative when this war is over.

As the automobile industry provided thousands of jobs after the last war, I believe that air transportation will provide thousands of jobs after this war, provided—and this is an important proviso—that the commercial air transportation companies are allowed to expand, and provided the public co-operates by taking full advantage of the benefits offered by this new form of transportation.

At the present time, American Airlines as well as many other domestic airlines,

(*Continued on page* 148)

SEAMEN IN 'Spits'

By
Lieut. (jg) JOHN R. NORRIS, USNR

Lieut. Francis Cahill steps into chute harness before mission.

U. S. Navy reconnaissance pilots, grounded because their seaplanes were too vulnerable, were retrained to fly Spitfires in the invasion.

A Royal Navy Air Station, Somewhere in England

THERE were close to a score of them—American Naval aviators ashore in England with no invasion billets. Their ships—the battleships and cruisers scheduled for a major part in the D-Day bombardment of the Normandy Coast—were standing by ready for action. But they had been stripped of all non-essentials and that included seaplanes and their pilots.

Of course, the invasion blue prints called for aerial direction of Naval gunfire against the Nazi shore defenses. Without it the destructive power of the warship batteries would be lost. But Sicily had shown that "sling-shot aviation"—the slow seaplanes catapulted from the warships to direct their gunfire—hadn't a chance in an operation like this. Fighter planes flying from fields in England were the answer—craft with enough speed, maneuverability and armament to take care of themselves. So the job had been assigned to *Spitfire* squadrons of the RAF and to Royal Navy *Seafire* units (carrier-type *Spits*).

But more aerial spotters were needed. And here were these Navy airmen cursing the fate that had grounded their *Kingfishers* and SOC's in English meadows and had left them to cool their heels in English pubs while the "big show" got under way. True, they had been trained as naval gun spotters and some had been flying since before Pearl Harbor, but virtually all of their experience had been in 100-m.p.h. seaplanes. But the flyers themselves insisted they could make the change to fast fighters, learn tactical reconnaissance over land and the new spotting procedure, even in the short time available. They were spoiling for action, and their insistence won them the right to try. They had to be transferred to fast fighters, learn tactical reconnaissance over land, and new spotting procedures in a short time.

U. S. Navy pilots are briefed for Normandy gun-spotting mission at Royal Navy air station.

The pilots first selected for the experiment were Lieuts. Alexander A. Smith and Francis A. Cahill of the U.S.S. *Augusta*, and Lieut (jg) John O. Robinson and Ens. Bruce Carmichael of the U.S.S. *Texas*. These four were given some old *Spitfires*, which were reputed to have seen service in the Battle of Britain. After only 10 hours in the *Spits* they were tremendously enthusiastic over the experiment. Gen. E. R. Quesada, who headed the U. S. Army Ninth Tactical Air Force and under whose supervision the test was made, also reported favorably to Rear Adm. Alan Kirk. Remaining pilots from the *Augusta* and those from the *Nevada*, *Arkansas* and *Tuscaloosa* were ordered to the Army field on May 7 to begin a 35-hour course of training—they were given just three weeks to complete it.

Squadron VCS-7, as it was designated, doubled training schedules from the very start. Its pilots flew morning, noon and night—taking their planes up after dinner in the long English evenings. Only a few of the group had ever flown a fighter, and their first task was to familiarize

(*Continued on page* 114)

Toward Simpler Air Rules

By HELEN ASHBY

Washington Staff Correspondent, United Press

Proposed CAR revisions encourage private flying through simpler rules and an increased reliance on pilot judgment and modern flight instruction.

THE Safety Bureau of the Civil Aeronautics Board has recently proposed revisions of the non-air-carrier operation rules which, if adopted, will allow private and commercial pilots far greater freedom to use their own judgment so long as their actions do not endanger the lives and property of others.

The suggested revisions, which would be grouped in a new section to be known as Part 43 of the regulations, is the third proposed revision of the Civil Air Regulations pertaining to flying, ownership, and maintenance of private and commercial aircraft. The other two deal with air traffic rules, Part 60, and with pilot certificates, Part 20.

In explanation of their proposal, members of the Safety Bureau state that Civil Air Regulations have grown increasingly complex and burdensome since the Government began to administer the Air Commerce Act of 1926. Many of these regulations aim at the protection of pilots who cannot be depended upon to use good judgment. Thus, the vast majority of pilots whose judgment can be relied upon are unnecessarily penalized.

The bureau wishes to place more dependence for safe flying on good instruction than on restrictive regulations. The present high standards of flight instruction have increased pilot knowledge of aviation, but many of the existing regulations were written before adoption of the standardized process of training. Some of the regulations now in effect were prepared for 1926 model planes.

Although the regulations have been cut by at least 50 per cent and reduced to simple, understandable terms, neither the operating standard nor the skilled requirements for instrument flying have been lowered. In fact, it has been indicated since the revision was circulated for comment, that instrument requirements will be raised. Flights under restricted visibility conditions require a high degree of pilot competency, and pilots not able to fly aircraft competently under such conditions become a menace to public safety. Opinion expressed in several comments received by the bureau is that the standards should be higher. The proposed revisions bring the regulations up to date. Jesse Lankford, director of the Safety Bureau, cites three objectives which the new regulations try to meet:

1. To eliminate from the regulations governing the student and private pilot and the ownership and operation of non-commercial aircraft all rules which do not have as their objective the public safety.
2. To group the rules so that pilots and owners can readily find the regulations which govern them.
3. To word the regulations so that they may be readily understood.

The bureau first separated all the non-air carrier operation rules, now scattered through various sections of the Civil Air Regulations—chiefly in Part 60, where they are mixed with air traffic rules, and in Parts 20, 01, and 04—and brought them together to form the new section, 43, which deals only with non-air carrier operation rules. Even more important than re-grouping, the rules have been reworded in simple terms so that they are easily interpreted even by student pilots. This is in direct contrast to the difficult legal terminology of present rules.

In circulating the revision for comment prior to its consideration by the CAB, Mr. Lankford drew particular attention to the following items:

1. *Airworthiness certificate duration.* An airworthiness certificate will expire in 12 months after its issuance or renewal. It is intended that certificates can be renewed either by an appropriately certificated mechanic or by an inspector of the CAA. This renewal may also be made as a result of a periodic inspection by the proper class of mechanic.

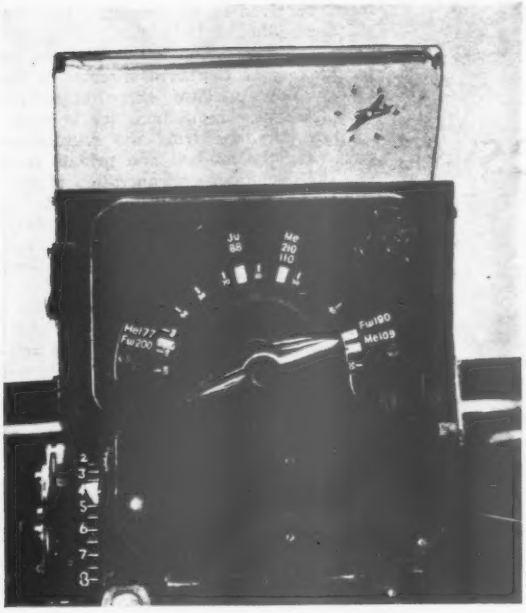
The bureau is now working on a revision of Part 24, relating to mechanic certificates and privileges, which would authorize local airport certificated mechanics to renew airworthiness certificates. This would relieve private plane owners of the necessity of going to Federal inspectors.

2. *Dual Controls.* It is provided that any private pilot rated for the aircraft may carry any person seated at operative dual controls, except that, when performing acrobatics, such person must also be a pilot.

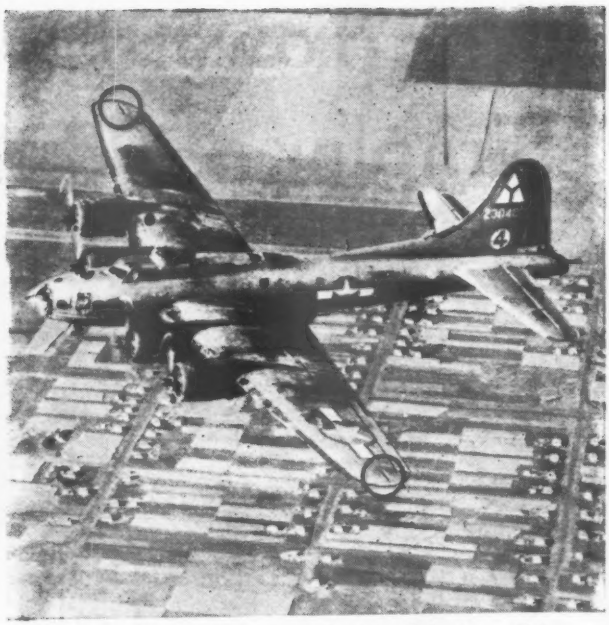
Present rules do not permit a private pilot, for instance, to take a non-pilot friend for a ride without first removing the dual controls. Under the revised rule, the friend could sit at the controls at any time except when the pilot was performing stunts. Accident statistics showed no justification for the present rule.

3. *Recent solo flight experience.* The present rule requiring a private or commercial pilot to be given a check flight before flying solo, if he has not made at least five take-offs and landings within the preceding six months, has been eliminated. No change is suggested with respect to the present requirement when passengers are involved. A pilot would still not be permitted to fly a plane carrying passengers unless, within the preceding three calendar months, he has made

(*Continued on page* 90)



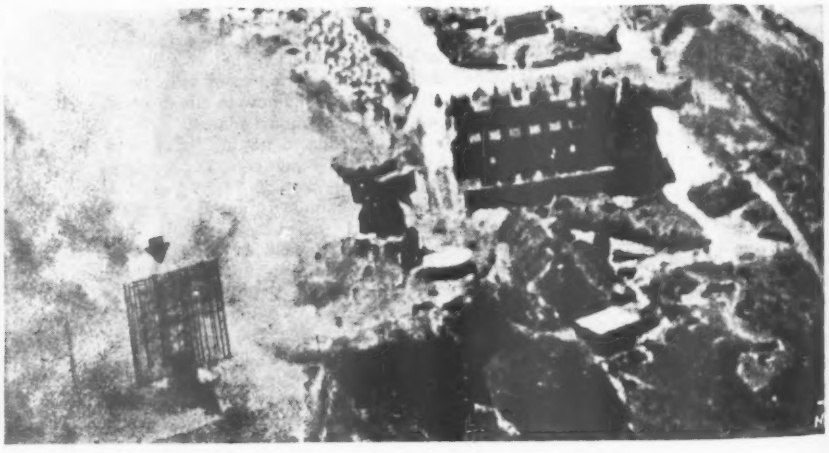
New British gyro gunsight has nearly doubled fighters' kills. Pilot sets range and plane type on dials, rest is automatic.



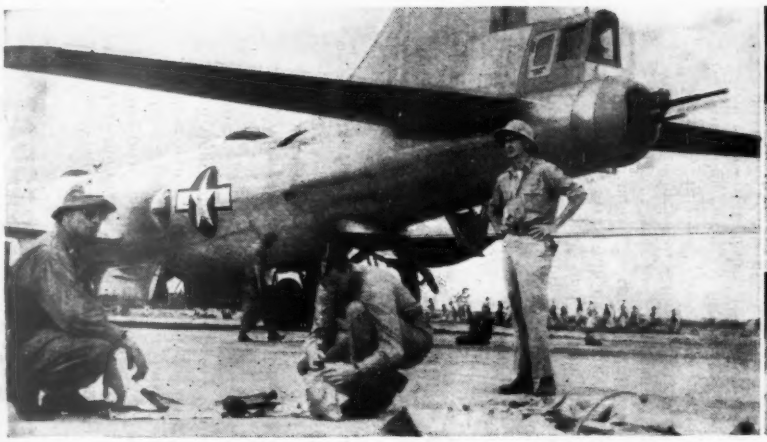
Circled wing tip slots on current Fortresses help carry off fumes in case of combat damage to fuel tanks. Other slots also are used.

HAVE YOU SEEN?

Bell's latest is the Kingcobra (P-63), shown here (lower plane) in an exact-scale comparison with the Airacobra. Kingcobra is about four feet longer, has 1,500 h.p., cannon and four .50's.



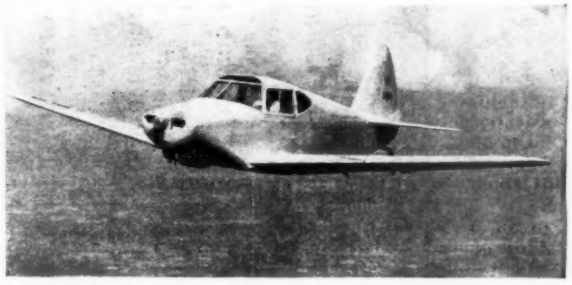
This is German radar station on French coast, photographed by an RAF Typhoon as it attacked station with rockets. Mushroom-like building to right of the station probably is antiaircraft tower.



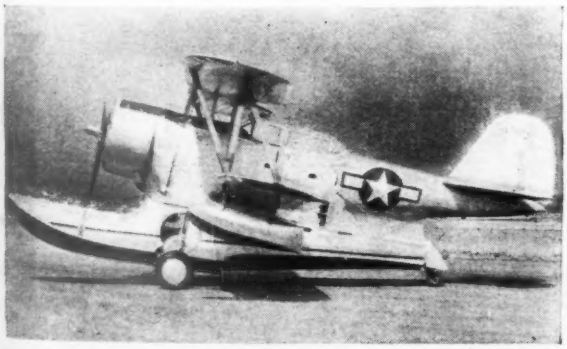
Boeing Superfortress has 12 .50-cal. machine guns and one 20-mm. cannon, all in remote-control turrets (left). Guns are fired from sighting blisters like that for top turret (right). The 20-mm. cannon is in the tail turret.

First picture of an unpainted Curtiss Commando (C-46) shows it in flight with another Commando which has old paint job. Engines are 2,000-h.p. Wasps, gross weight 50,000 pounds, top speed 264 m.p.h.

Four jet units totalling 1,320 h.p. aid Avenger's 1,700-h.p. engine in take-off. Jet units reduce take-off runs up to 60 per cent.



Aeronca Arrow is experimental post-war lightplane. Engine is 90 h.p., top speed 135 m.p.h., cruising, 125. Span is 30 feet, length 21 feet.



Grumman-designed Duck (J2F-6) is in production for Navy by Columbia Aircraft Corp. Wing span is 39 feet, top speed nearly 200 m.p.h.

Designed and built in 65 days during Battle of Britain, Miles M-20 fighter was all wood, had fixed landing gear, eight .30-cal. guns.

Procedure When Wearing Conventional Seat or Back-Type Parachute

When an emergency develops in the air and it becomes necessary to bail out of your airplane, there is no time for confusion or second guessing. The procedure must be automatic. The instructions below and the diagram show through what hatches and in what order crew members should make their exit. Ground drills based on this procedure will help you obtain the efficiency and speed necessary to abandon your airplane successfully and safely.

Wherever possible, jump from the after end of the hatch. Where several crew members bail out of the same exit, each should inspect the others to make sure that all are wearing a full complement of equipment, securely fastened.

PILOT—Exits fourth through forward end of bomb bay. Last to leave plane.

CO-PILOT—Exits second through forward end of bomb bay.

NAVIGATOR—Exits third through forward end of bomb bay.

RADIO OPERATOR—Exits first through forward end of bomb bay.

UPPER TURRET GUNNER—Exits second through after end of bomb bay.

TUNNEL GUNNER—Exits first through after end of bomb bay.

TAIL GUNNER—Exits third through after end of bomb bay.

Procedure When Wearing Quick Attachable Chute Harness...

When the order is given over the inter-com to "Abandon Airplane," each crew member will remove the individual seat-type dinghy and breast-type parachute from their respective positions near his station, snap them onto his QAC harness, and exit through the hatch specified. The following instructions, used with the diagram, show the positions of the dinghies and the parachutes, the correct exit hatch, and the order of bailing out. Where several crew members bail out of the same hatch, each should check the others to make sure that all are wearing a full complement of equipment, securely fastened. Wherever possible, jump from the after end of the hatch. Remember, a life vest should be worn under the QAC harness on all overwater flights. The lanyard on the dinghy should be snapped onto the D-ring on the life vest.

Periodic ground drills will familiarize your crew members with the operation of the QAC harness and the order of bail-out.

PILOT—Parachute mounted on armor plate, directly behind pilot. Dinghy worn in seat position. Exits fourth through forward end of bomb bay. Last to leave plane.

CO-PILOT—Parachute mounted above pilot's parachute on armor plating, directly behind co-pilot. Dinghy worn in seat position. Exits second through forward end of bomb bay.

NAVIGATOR—Parachute mounted on port side, above radio operator's head, between astradome and forward bulkhead. Dinghy worn in seat position. Exits third through forward end of bomb bay.

RADIO OPERATOR—Parachute mounted overhead in radio compartment on port side, next to navigator's parachute. Dinghy worn in seat position. Exits first through forward end of bomb bay.

UPPER TURRET GUNNER—Parachute slung from main span in roof of aircraft, directly above tunnel gun. Dinghy mounted to port on after side of upper turret shield. Exits second through after end of bomb bay.

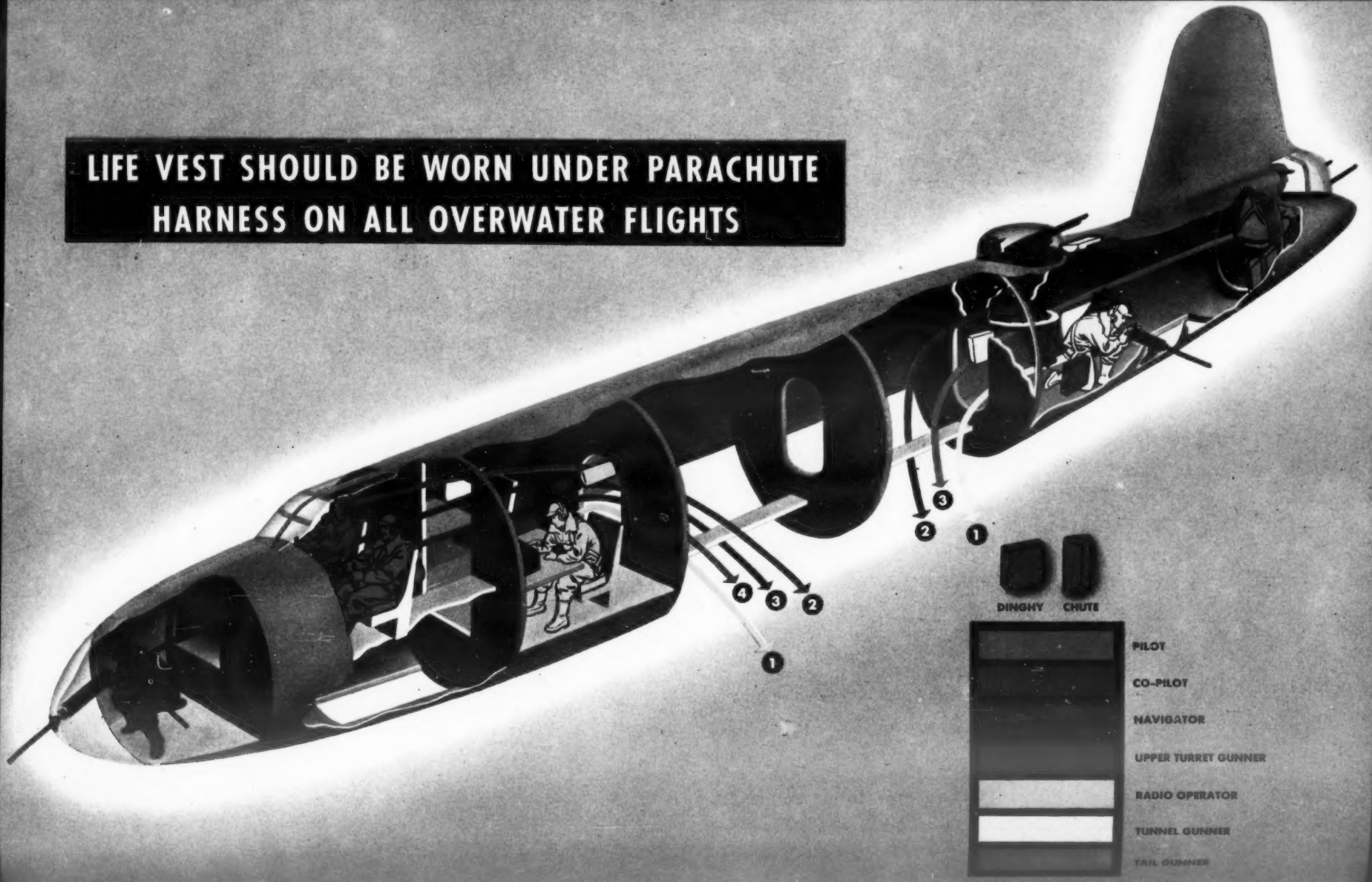
TUNNEL GUNNER—Parachute slung overhead from main span in roof of plane, directly above tunnel gun. Dinghy mounted to starboard on after side of upper turret shield. Exits first through after end of bomb bay.

TAIL GUNNER—Parachute and dinghy side by side on port wall near floor, just forward of tail gunner's compartment. Exits third through after end of bomb bay.

Nothing is as important to a member of an air crew as being able to make his parachute escape from a disabled plane quickly and as safely as possible. U.S. Army Air Forces safety experts have devised a bail-out poster for every combat type of aircraft in the AAF. The one dealing with the Martin Marauder is reproduced in color above. It, and the explanatory text below, was made available to FLYING by the AAF Flight Control Command, Safety Education Division, and the School of Applied Tactics.

How To Bail Out of the Marauder

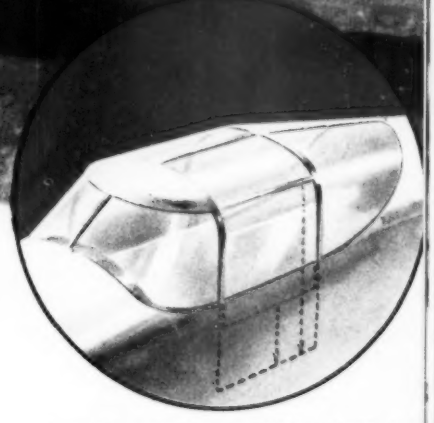
LIFE VEST SHOULD BE WORN UNDER PARACHUTE HARNESS ON ALL OVERWATER FLIGHTS



Procedure When Wearing Conventional Seat or Back-Type Parachute

THE CURTISS HELLDIVER, THE NAVY'S NEWEST DIVE-BOMBER NOW IN COMBAT.

THE CURTISS HELLDIVER, THE NAVY'S NEWEST DIVE-BOMBER NOW IN COMBAT.



Arrows indicate how both top and side panels slide down into fuselage wall. A lock on top where panels meet secures the entire cabin.

Control Tower Vision gives new flying safety and pleasure . . . . .

Wide, clear vision is ***one*** reason why you'll enjoy flying the ***New Swift.***

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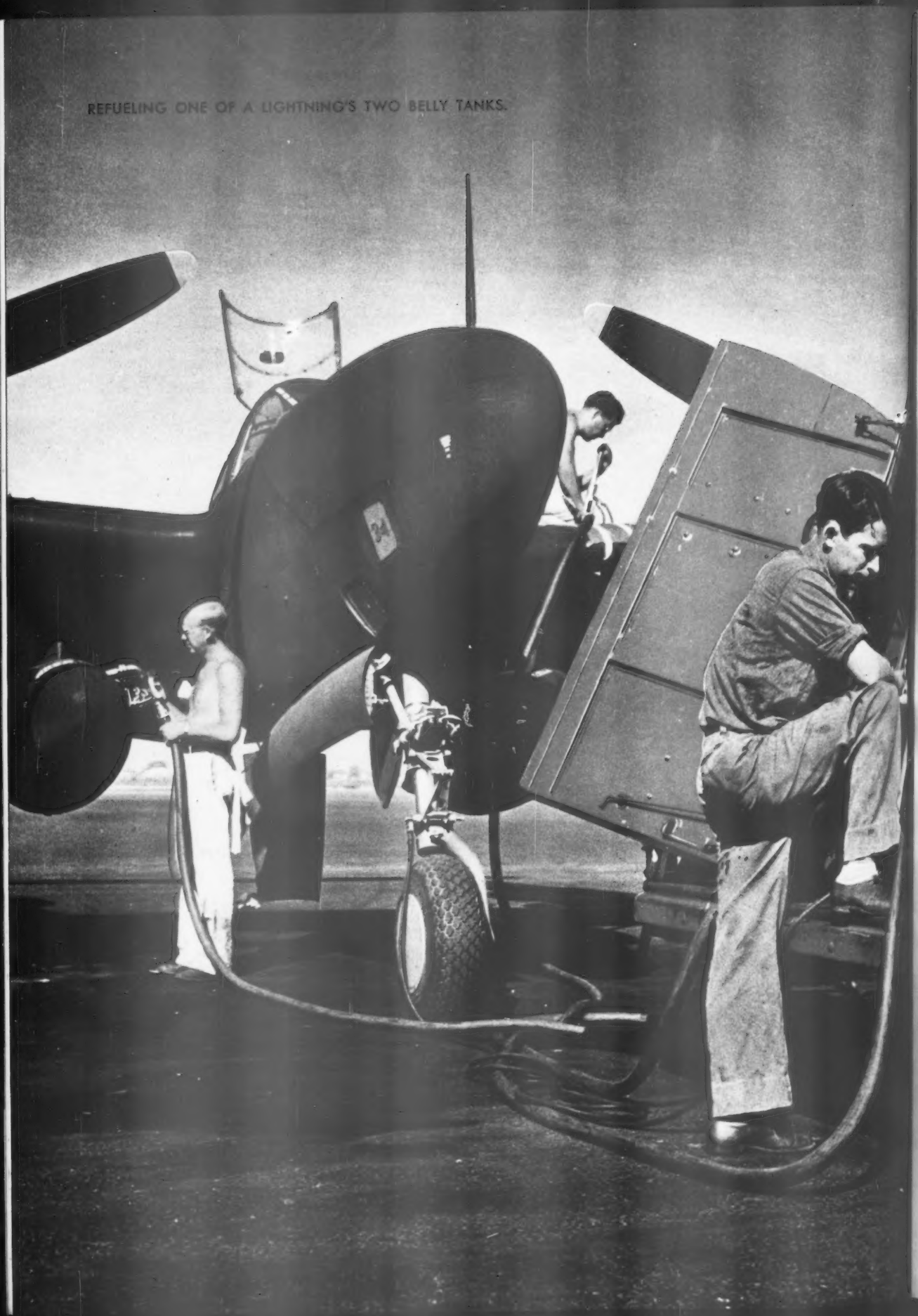

REFUELING ONE OF A LIGHTNING'S TWO BELLY TANKS.

MEXICO?

JUST A 'MAÑANA' AWAY FROM CHICAGO

1 ***"MEXICO . . . EXCITING, COLORFUL NEIGHBOR!*** You're next on our important visiting list. See you *manana,* neighbor. That 'tomorrow' is partly figurative . . . meaning 'after the war,' of course. But it's literal, too, because . . .

2 ***"BEFORE SUNSET TOMORROW,*** we can easily cover the 1900 air miles from Chicago to Mexico City in our Cessna. A simple, two-day cruise along the sunlit skyways. And there will be air parks all the way for us to land on."

3 ***TUNE UP YOUR IMAGINATION,*** because it—not mileage or time schedules—will limit your travels when you're *seeing all America* in your Cessna.

When you can go 500 miles in a morning, you can get a whale of a lot more out of life, Mr. and Mrs. America. And to facilitate Cessna travel, most wide-awake communities are already planning air parks (landing strips as in the picture.)

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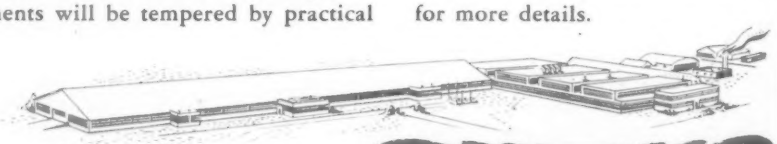

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FOR IDENTIFICATION

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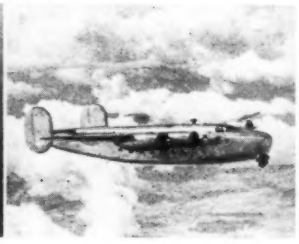

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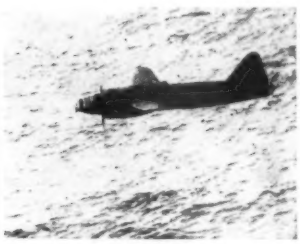

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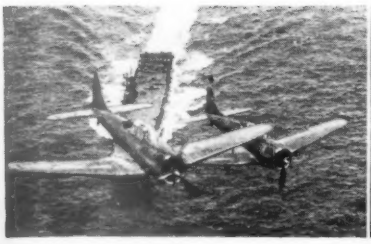

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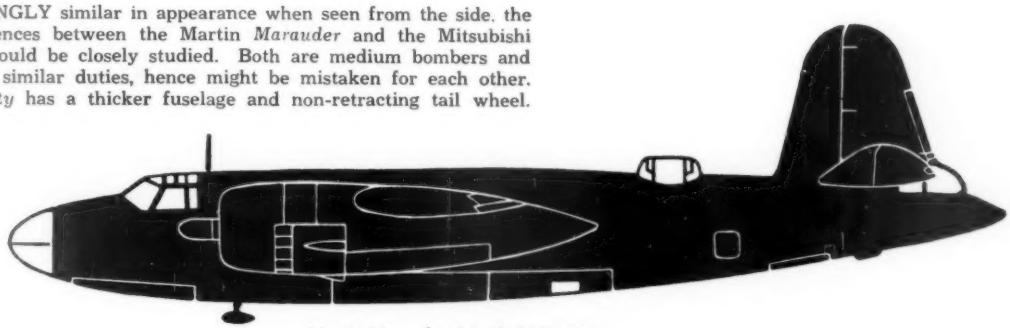
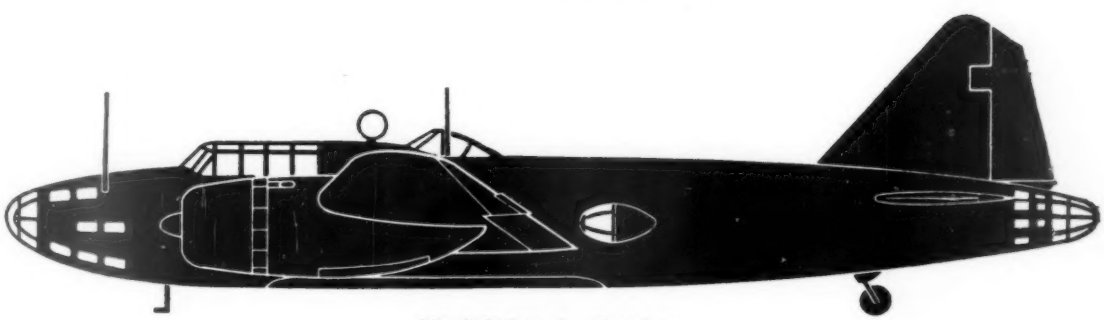
The planes are: 1. Martin *Marauder*. 2. Consolidated *Liberator Express*. 3. Bell *Airacobra*. 4. Mitsubishi *Betty*. 5. Douglas *Dauntless*. 6. Boeing *Flying Fortress*. 7. Northrop *Black Widow*. 8. Fairey *Barracuda*.

MISTAKEN IDENTITIES

STRIKINGLY similar in appearance when seen from the side, the differences between the Martin *Marauder* and the Mitsubishi *Betty* should be closely studied. Both are medium bombers and perform similar duties, hence might be mistaken for each other. The *Betty* has a thicker fuselage and non-retracting tail wheel.



Martin Marauder, length 57 ft. 6 in.



Mitsubishi Betty, length 64 feet.

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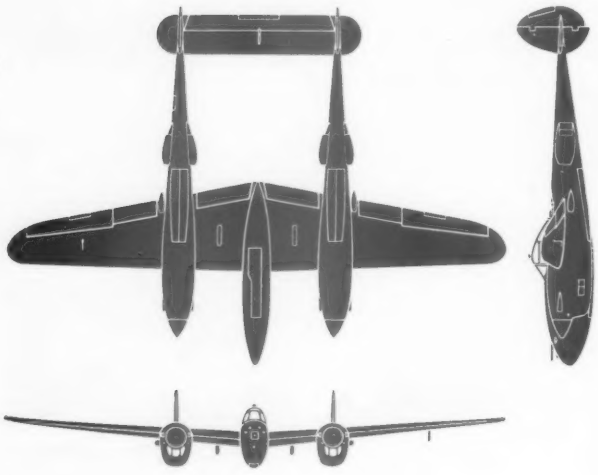
LOCKHEED LIGHTNING (P-38J)

Escort Fighter



PERTINENT FACTS: This is the latest modification of the *Lightning* to be announced by the AAF. An earlier version of this fighter was shown in this section in the November, 1943, issue. The "J" differs from earlier *Lightnings* in that its Allison engines are rated at 1,500 h.p. each, and new flap boosters are fitted, giving the newer model exceptionally good maneuverability in combat. Wing span is 52 feet, length, 37 ft. 9-5/16 in.; height, 12 ft. 10 in. Gross weight is 18,000 pounds. Maximum speed is over 425 m.p.h. Additional fuel tanks have greatly increased the range, and 2,000 pounds of bombs can be carried under the center section. The armament remains the same: four .50-caliber guns and one 20-mm. cannon in the nose. Highly versatile, the *Lightning* is used as a fighter, bomber, strafer, camera plane, tank buster. It can tow a loaded 15-place CG-4A glider.

WHAT TO LOOK FOR: The same, hardly-mistakable lines of the *Lightning* are retained. The engine cowls of the "J", however, strongly resemble that of the Curtiss *Warhawk*, having been deepened considerably. The two center section rack attachments, for bombs or fuel tanks, are standard.

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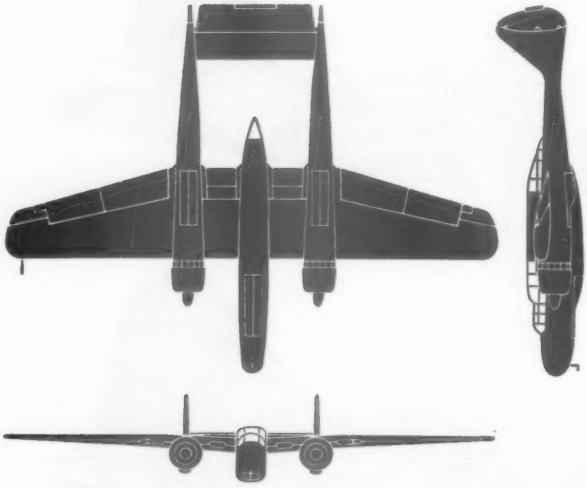
NORTHROP BLACK WIDOW (P-61A)

Night Fighter



PERTINENT FACTS: The first American night fighter designed specifically for that work, the *Black Widow* is in combat over France. Armed with 20-mm. cannon and .50-caliber machine guns, the *Black Widow* also, according to a Swedish source, is equipped with radar for the hunting of enemy planes. Wing span is reported to be 66 feet, length, 48 ft. 11 in. The XP-61 first was flown on May 26, 1942. The engines are two 2,000-h.p. air-cooled *Double Wasps*. Gross weight is over 25,000 pounds. The crew is three men.

WHAT TO LOOK FOR: A high-mid-wing monoplane, the *Black Widow* resembles the North American *Mitchell* from the front and the Lockheed *Lightning* from the side and underneath. The wing is cantilever, has straight leading edge, tapered trailing edge and blunt tips. An ingenious combination of ailerons, flaps and spoilers is fitted. The landing gear is tricycle.

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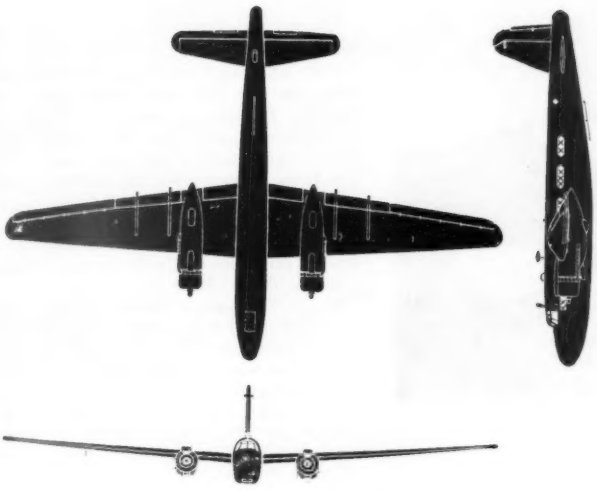
VICKERS WARWICK

Transport



PERTINENT FACTS: Originally designed as a medium bomber to replace the veteran Vickers *Wellington*, the *Warwick* now is used as a 34-passenger transport. Powered with two 2,000-h.p. air-cooled Pratt & Whitney engines, the *Warwick* can carry a gross load of 45,000 pounds for a non-stop range of approximately 1,000 miles. Wing span is 96 ft. 8½ in., length 70 ft. 6 in., height, 18 ft. 6 in. Cruising speed is 225 m.p.h. at 10,000 feet.

WHAT TO LOOK FOR: Like the *Wellington*, the *Warwick* is a mid-wing, cantilever monoplane. The wing has narrow chord, leading and trailing edge taper, and pointed tips. The fuselage is narrow and deep, and is of geodetic construction. The landing gear is conventional.

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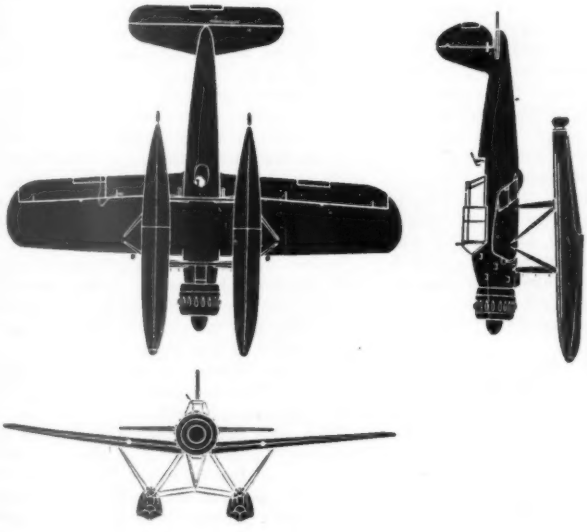
ARADO Ar-196A

Reconnaissance



PERTINENT FACTS: For some time the German navy's standard catapult reconnaissance seaplane, the Ar-196A is a two-place low-wing monoplane and has a single 920-h.p. air-cooled engine. Top speed is 193 m.p.h. at 13,000 feet, range is 670 miles, service ceiling, 23,000 feet. Wing span is 49 ft. 2½ in., length, 38 ft. 2½ in., height, 17 ft. 2¼ in. Gross weight is 8,200 pounds. Armament is two fixed cannon, two fixed machine guns and one flexible machine gun.

WHAT TO LOOK FOR: The wing is stubby, has deep chord, moderate taper and blunt tips, much like the American Vought *Kingfisher*. The engine is marked by streamlined bulges over each cylinder head. The fuselage is round and shallow, tapering down to the conventional tail. The Ar-196A has the twin floats as shown here. The Ar-196B has a single main float and small wing tip floats.

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I Learned About Flying From That!—No. 61

Author, with coat open, stands beside his wrecked Kinner Bird.

By JAMES GITTINGS

As told to Leverett G. Richards

This pilot figured a down slope would help his take-off more than the wind. His plane was an 80 per cent washout.

WHEN I received my private license I was a "know-it-all." That's what a certificate meant, I decided. It certified that a man knew all outside of aerobatics, of course.

I was wrong.

It cost me a $1,000 airplane to find that out. There are half a dozen pilots within an hour's hop from my home field who have learned the same lesson in the same costly way. The kind of mistake we made is always costly but seldom fatal. It's an error directly traceable to a weakness in present methods of instruction—one easily remedied. That's why I'm telling this tale of woe and ignorance—in the hope that it will lead to compulsory instruction in the important art of not taking off.

I had flown my wife to Everett, Wash., to see her folks, partly for the trip, partly to pile up time. I had about 120 hours and was aiming at a commercial license. The old 100-h.p. Kinner *Bird* had just been relicensed 20 hours before. She shone like a Jefferson nickel, with her silver wings and new red-painted fuselage. Even her brand new tires seemed to shine in the sun as we came down for a routine landing at Chehalis, Wash., a grass field on the Seattle-Portland airway.

I took on 10 gallons of gasoline and taxiied out for the take-off. I had been practicing plotting a careful course on the trip up north past Seattle to Everett. I still had the compass course for each leg but I didn't bother to figure a reciprocal course for the return flight, which lay almost true south. Why should I? I had just been over it. It was a perfect day, not a cloud in the sky. I could see for 40 miles.

So I took off and idly swung the nose of the plane up the broad, partly-timbered valley that should lead to Kelso, thence to the Columbia River and Vancouver, Wash., my destination, just across the river from Portland, Ore. After about 10 minutes I began to look for check points. The valley looked about right, but the mountains rose higher and grimmer on either side than I remembered them.

Another 10 minutes. I should have sighted the Toutle River by now. Instead, there was only cut-over land and a few farms, no level river bottoms. By now I knew I was lost. I couldn't figure where my correct course lay, and with only one and one-half hour's gas in the tank I couldn't afford to guess.

I looked for a field. There were lots of them, but all small, some with deep gullies. Finally I picked a freshly-cut hayfield and set her down for a rough landing, but safe enough.

I found I was seven miles east of Raymond, seven miles from the Pacific Ocean, 40 miles off my course. Chehalis lies at the head of two valleys and I had headed down the west valley to the sea instead of the south valley to the Columbia River. I breathed easier. Just a matter of a half hour's back-tracking.

I took a look at the field. It was rough, crossed by rather sharp hollows 18 to 24 inches deep. It slooped from west to east, with perhaps a five-foot drop in 600 feet of length. No obstructions at either end, except for the barbed wire fences.

There was a steady sea breeze just discernible from the west. I decided to take off tail to the breeze, counting on the downslope to help me more than the wind.

She picked up speed quickly for the first 100 feet. Then the bumps seemed to check her. She would leap forward, then squat as the long oleo shocks took the bumps. The ground was certainly going by at flying speed. But she wouldn't fly. So I held her tail up and tried some more. The fence at the end of the field was coming up to meet us pretty fast now, certainly fast enough to spell flying speed. I was sure she would jump the fence. I waited until the last minute then hauled back on the stick.

She didn't even get off the shocks. Next thing I knew I was sitting with my hand on the wide-open throttle wondering why everything was so quiet. Neither my wife nor I had a scratch nor a bruise. But the ship was an 80 per cent loss. She squatted wearily on the stumps of her shattered prop, her landing gear folded under her like a sick chicken.

The lower wings were hanging on the fence, where three solid cedar posts had bowed a little to let her slip over and through the barbed wire. Nothing can make a worse mess of a ship without hurting its passengers. Five other pilots within 40 miles of the home hangar have brought their ships home by the handsful after pulling the same boner I did—trying to get out of a field that just wasn't big enough, considering circumstances.

Why didn't somebody tell us it couldn't be done? Or at least tell us when to cut the throttle and call it quits? Why didn't our instructors tell us when not to take off? Why didn't the CPTP course provide such instruction? There was nothing in the outline for CPTP instruction about practice in not taking off.

It happens some time in the life of every pilot who flies cross-country. Some day we all have to decide whether to let her sit and wait for a wind or a cold spell, (this was a hot day, by the way), whether to take off down hill or up hill, whether to let her sit until the crop is cut, or whether to just let her sit.

Before a man gets his private license why shouldn't his instructor be required to take him out to selected fields and tell him: "See this tall grass? You can't get flying speed in that stuff. Don't try it.

"See the bumps in this field (rocks maybe)? They're too tough. Don't try to take a plane over them.

"See this field? It's long enough if you've got a good wind in the right direction. . . . But on a hot day . . . Don't ever try to take off with a tail wind just to take fancied advantage of a slope that isn't sufficient to give you any real speed."

Instruction like that wouldn't fit every situation, but if it saved one such smash as the one I've just described it would be worth the price of admission. END

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Letters

NO FLYING; NO ACCIDENTS

Sirs:

I was much interested in Charles E. Planck's article, entitled "What Was Wrong with Private Flying?" in the September issue of FLYING. The percentage table it cited indicated that only four per cent of pre-war plane owners gave "too much regulation" as the reason for selling their planes. Since the article points out that letters on which the statistics were based were unsolicited, I believe that the actual percentage is much higher.

"Too much regulation" has been a constant deterrent to private flying, especially with respect to costs. It adds to the cost of instruction, multiplies the expense of even minor repairs, and causes needless and costly inspection delays.

Since records of the CAA itself show that a very large majority of accidents are caused by a lack of pilot judgment, it should be self-evident that the chief way regulations keep down accidents is by keeping down flying.

C. R. POWELL

East Sparta, Ohio

FLYING ENGINEERS

Sirs:

I have just received a copy of the March issue of FLYING and have read with much interest the very excellent article on "Reclaiming Enemy Airdromes." Aviation engineers appreciate such articles as this which recognize their contribution to air warfare.

For your future reference I should like to point out, however, that you do not clearly differentiate between the airborne engineer battalions with their light equipment, and the standard heavily-equipped battalions which constitute the bulk of the aviation engineers. Of the 100 battalions you mention, the majority are standard battalions, equipped for the heavy jobs of clearing and earth moving. The airborne battalions cannot compare with these in effectiveness any more than a hastily-thrown light pontoon bridge can take the place of the heavy trestle bridges that will replace it.

One other very minor correction. In referring to me as one of "Toohey" Spaatz's engineers you have evidently confused me with Gen. Don Davison, Chief Engineer of the Mediterranean Air Forces, whose recent death deprived us of one of the most outstanding aviation engineers. For two years I served as General Arnold's Air Engineer until I came over here last December. I am now air engineer in this theater, under General Stratemeyer.

BRIG. GEN. S. C. GODFREY

ASC, China-Burma-India Theater.

RIGHT! WE'RE WRONG

Sirs:

I would like to call to your attention the correct designation of the Dornier in your "Mistaken Identities" department, page 71 of the September issue of FLYING.

The plane is a Dornier Do-26; not a Dornier Do-24 as it is identified on that page.

ALEX ZSIRAY

Long Island, N. Y.

JUST FOR FUN

Sirs:

This letter is provoked by the article "Proposed CAR Revisions" in the April issue of FLYING—it is written for myself and several other fighter pilots.

Finis la guerre, we want to fly as private citizens, for *fun*. We are getting the impression that the CAA is a "tool" of the commercial flying interests—plus another source of civil service jobs, more Government "time Hitlers" and "red tape." For those of us who want to fly for the fun of it, at a price we can afford, we suggest:

1. No requirement of two-way radio (costs too much).
2. A minimum of restrictive rules.
3. Permission for pilots to repair their own planes (a lot of Government licenses means excessive repair costs).
4. No flight plans or other "forms" for local pleasure flying.

We write to FLYING because it has done more for the private pilot than any other agency—our service status prohibits us from writing to Congressmen, anyway.

FIGHTER PILOTS

China-Burma-India Theater.

STINGER FOR WASPS

Sirs:

We are a group of flying lieutenants of a bombardment squadron now in the South Pacific who noticed a comment in the April issue of FLYING with respect to the Wasps.

In our opinion the Wasps have done a wonderful job and there should be more of them to release some of our highly self-praised ATC (Allergic to Combat?) jockeys.

We grant the ATC boys—who evidently wrote the comment—the right to exercise their talents for self-praise, but let's have fewer cracks about the work of other groups.

Lieuts. JOHN A. ALLISON, HAROLD M. MORSE, and JOSEPH R. JAMISON

Pacific Theater

DOUBTING GUNNERS

Sirs:

We should like to raise a question with respect to a statement made in the article "Curve of Pursuit" in the July FLYING.

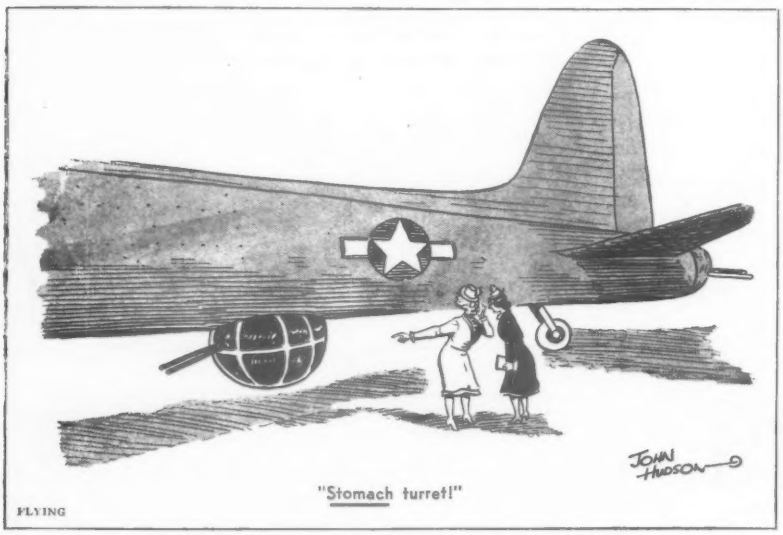
The statement said in effect that one of a group of newspapermen who had not previously fired a machine gun made a score of 80 hits out of 100 rounds on a moving target 400 yards away—and that the record was made after only one hour of verbal instruction.

Several of us who are students at the Naval Aviation Gunnery School at Jacksonville, Fla., are inclined to believe that either there has been a misprint or a gross exaggeration. Can the statement be authenticated?

GUNNERY STUDENTS

Jacksonville, Fla.

● Firing from the waist gun position of a *Flying Fortress* at a long strip target towed by another plane at 400 yards distance, Gaither Littrell, Associate Editor of FLYING, scored 80 hits out of 100 rounds in a test conducted at the Yuma Army Air Field last March 12. The score, though unofficial, is authenticated by AAF officers. There is a possibility of slight error in that other newsmen who took part in the test fired painted bullets, while Littrell used unpainted ones. A few of the painted bullets may have left no marks on the target, though they are designed to mark it.—ED.



"Stomach turret!"

FLYING

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THE LIBRARY

MAN'S FIGHT TO FLY, by John P. V. Heinmuller; published by Funk and Wagnalls Company, New York and London, in 1944. 366 pages. Price $6.00.

The writing of history is always difficult. It must avoid bias of changing social, economic or political conditions. It must winnow errors of fact out of secondary material where research cannot be made among original sources. It should never reflect personal animosity or undue admiration. All this explains why there are few definitive historical writings which can be regarded as the final words on any period.

The author of *Man's Fight to Fly* has steered a course around most of the foregoing pitfalls. First, he wrote of his own personal knowledge and then he engaged in long and laborious research. Not content with this painstaking personal study he had his manuscript checked by some of the leading authorities in this country. The result is that the public now has available a carefully written, excellently illustrated history of flight.

The book is divided into two sections. The first relates the stories of the great flights of the past 20 years. Of almost all of these Mr. Heinmuller writes with personal knowledge. He timed many of these flights and was a friend of the pilots. But, in addition to his intimate knowledge of the aviation personalities of our time, he is an inveterate collector of aeronautical memorabilia, particularly air-mail covers that were carried on famous flights. From his photo collection he has provided the pictorial background of each flight.

The second section of the book gives thumbnail biographical sketches of 250 of those who have made aeronautical history. Each sketch is illustrated by a pen-and-ink drawing of the person and a drawing of the device for which he is best known.

As a biographical history of aviation and as an illustrated chronology of flight, the book is unique. It will be of interest to the general public and will be treasured particularly by those who are a part of this great world-changing development.

LESTER D. GARDNER, President
The Aeronautical Archives

A GUIDE TO NAVAL AVIATION, by Lieuts. W. W. Elton, A. F. Driscoll, R. N. Burchmore, and Lieut. (j.g.) G. B. Larkum; published by the McGraw-Hill Book Company, 330 W. 42nd St., New York City, in 1944. 296 pages. Price $2.50.

This is one of the most complete presentations of the subject of U. S. naval aviation that has yet been written. In clear, large type, modern format, and with plenty of good illustrations, the book is excellent for use either as a text or as a handy reference.

Primarily adaptable to classes of students who wish to gain an overall knowledge of aviation, it covers in 15 chapters the story of flying from its early development to modern operations. The Naval slant is especially emphasized in a chapter which should prove interesting to wartime readers—the chapter on the aircraft carrier, which describes striking power of this relatively new weapon.

While it is true that the book contains in 296 pages material which is usually expanded into several volumes, the four authors have covered the field remarkably well. They have presented a complete story for those who want to become indoctrinated in aviation in general and Naval aviation in particular. It is especially good for the layman who wants a bird's eye view of Naval aviation.

JOHN R. HOYT
Author of "Safety After Solo."

MODERN AIRFIELD PLANNING AND CONCEALMENT, by Maj. Merrill E. DeLonge; published by the Pitman Publishing Corporation, New York and Chicago. 167 pages. Price $4.

You can build a military field visible for 50 miles, or one which only the sharpest bombardier's eyes or the finest camera lens can discover.

Dealing with just such facts, Maj. Merrill E. DeLonge of the Army Air Forces has written a book which is virtually a manual for military airport designers and builders.

If his 167-page work had to be boiled down to a few words, Major DeLonge would probably give these five steps for guidance to such builders: First, select the site in terrain that offers the greatest opportunity for concealment; second, build in the maximum concealment by saving the terrain features; third, plan all facilities to avoid formalizing placement; fourth, select colors and textures carefully; and fifth, hide your scars.

The ultra-visible field results when a great area is scraped off to one level as the first step in preparing an airport. Such a field was once built by Americans on an island in the Atlantic. But the English, closer to the war, showed us how trees and terrain could be used to hide their fields so effectively that they have to guide flyers back to their home bases. The heedless bulldozer, leveling everything in its path, destroys valuable concealment features. Poor planning in advance often leaves a signpost for bombers by clearing railway and roadway and taxiway routes far wider than necessary. A 200-foot road through a forest is wide enough for bombers, and flanking trees will virtually conceal the road from the air.

Bombers must line up targets from low angles, but a well-wooded town or cantonment is hard to locate under a 60° angle.

Formalized arrangement of buildings promotes visibility. So do scars resulting from grading, sewer pipe laying and drainage ditches. Sod is perfect camouflage for scarred areas or plane dispersal revetments.

The most conspicuous runway is made of concrete. Soil cement paving is almost as bad. Asphalt or any black or gray paving is much better and an all-over turf field, usable the year round, is the best.

Use existing creeks, familiar buildings, existing trees and faked or natural details, Major De Longe advises.

Tabulated advice and rules for efficient camouflage and concealment, plus an alphabetical index, makes the little book a handy manual for air fighters who have enemies to hoodwink.

CHARLES E. PLANCK
Civil Aeronautics Administration

"You flew only 300 feet underground this time, Smith! Been boning up?"

Meet CAPT. VIRGIL TURNBULL

Two-million-mile veteran Braniff pilot Capt. Virgil Turnbull stands for the kind of flying that has won for Braniff the National Safety Award for four successive years. Born in McClain Co., Okla., Turnbull began flying in 1922. After several years' "barnstorming," he became a transport pilot in 1929; joined Braniff in 1936.

Capt. Turnbull is "briefed" for Link Trainer refresher course problem by Chief Pilot R. V. Carleton and Director of Instrument Flying Claude Seaton.

Turnbull gets ready to "take off" in the Link. His problem is to approach X airport on instruments, guided by radio signals

Mrs. Betty Nance, Braniff Link Instructor, gives Capt. Turnbull the weather and other conditions of the flight through the interphone.

Capt. Turnbull demonstrates his skill at instrument flying by making a perfect approach to X airport. Another happy landing in the Link.

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AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

The Aircraft Owners and Pilots Association (AOPA), with National Headquarters Office located in the Carpenters Bldg., Washington 1, D. C., is a non-profit organization composed exclusively of pilots. It looks after the pilot's best interests in all phases of aviation and helps individual pilots with their individual problems. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is edited by the Aircraft Owners and Pilots Association and opinions contained in it are not necessarily those of FLYING. A special bulletin is sent each month to all registered AOPA pilots and also confidential newsletters from AOPA's Washington staff are sent members from time to time.

HIGH COST OF REGULATION

THE CAB has just proposed an additional part to the Civil Air Regulations—Part 17 which would set up a new section in the CAA to control, supervise and dictate the policies to be followed in the manufacture of aircraft and engine flight instruments.

It appears that somebody must have left the back door open again, for this is the first new rule that has been slipped in for some time. We believe that it is a needless one, at least while civil aviation is semi-dormant due to the war. AOPA has expressed the preliminary comment to the CAB that at best this type of additional regulation should wait until non-scheduled aviation has been restabilized and the men overseas have returned to express their opinions on such matters. There is nothing in the record which would indicate a necessity for setting up standards or for licensing or inspecting aircraft instruments. There is no trend which shows great numbers of aviation accidents to be caused by malfunctioning of instruments. In fact, we have been unable to find a single accident report in the past three years which would indicate that there has been loss of life due to instrument malfunctioning.

Regulation licensing, and all of its by-products, has failed to make any part of flying cheaper. It has invariably increased flying costs to the plane owner and individual pilot. We believe there is nothing in the proposed Part 17 of the CAR which would make instruments any less expensive.

Members interested in this subject are invited to write their views.

UNIT ACTIVITY INCREASES

Renewed interest in flying is evidenced in the reactivation of a number of AOPA Units in recent weeks and the formation of new ones throughout the U. S. and in other countries where AOPA members are presently residing.

EMERSON E. GOFF (AOPA 7026), for instance, has submitted a plan for an AOPA Unit in the Panama Canal Zone. Goff, whose picture is shown below, has worked up an interesting program which is now being studied by AOPA's Executive Committee. If approved, this Unit will tie in with those established in Mexico City and in southern countries in connection with post-war routing service for AOPA members.

Signs of new activity have also been noted in New York, Des Moines, Chicago, and other points. Unit activities are particularly outstanding in sections where state legislatures have introduced aviation measures. AOPA pilots are, therefore, urged to review the June, 1944, issue of the AOPA *Pilot* which was devoted to a description of proposed state legislation that last year exceeded 1,000 proposals. Many of these proposals if passed would provide for increased aviation gasoline taxes, landing fees, state licensing of aircraft and airmen (also for a fee), licensing of airports, and complicated state air-traffic regulations. AOPA is taking a vigorous stand against the passage of these restrictive measures.

SERVICE OFFICE EXPANDED

Membership service demands have become increasingly heavy during the past few months and the AOPA has, therefore, recently expanded its facilities in Washington. The move is designed to give members of AOPA even better service on their personal flying problems.

The change includes consolidation of the Registrar's Office in Chicago with that of the Washington Service Office. Because membership requests for personal services revolve around problems concerning aircraft purchase, priorities, license difficulties, CAR violations, airway aids, licensing of aircraft, transmitters, etc., it was decided to employ additional help at Washington where these various aviation departments of the Government are headquartered.

Emerson E. Goff, AOPA 7026, who plans an AOPA Unit for the Canal Zone (see item).

FLIGHT RULE DROPPED

AOPA has learned that the First CAA Region, whose territory includes the eastern Vital Defense Area, has rescinded the requirement for flight plans in the VDA when contact weather conditions prevail. This is a small but important relaxation and certainly will remove a part of the present inconvenience for flyers who have business to conduct by airplane on the East Coast.

AOPA is endeavoring to have rescinded the present restriction which prohibits flight of civil aircraft within two miles of the coast beginning at Jacksonville, Fla., and running around the state of Florida to Brownsville, Tex. AOPA is also endeavoring to have the eastern Vital Defense Area eliminated, or at least reduced in size, so that operators who have been holding onto airport sites at great personal expense may reopen and participate on an equal basis with persons located on the other side of the "dreaded line." There is also some hope that the regulation which at present prohibits primary training in both the western and eastern Vital Defense Areas may be rescinded. This is the key to reopening a number of airports since it is seldom possible for an operator to break even unless he can augment his service business by instructing new students. This is particularly so at this time when the sale of new aircraft is impossible.

In short, it appears to many that the continuation of restrictions against non-scheduled civil flying, in view of the foregoing relaxations, may be both unnecessary and somewhat discriminatory.

BOUQUETS FROM PFA

The following letter from the Private Flyers of America, Inc., relates to AOPA and a problem of removing power lines around an airport. It is this kind of service we are endeavoring to give to pilot-members, and we are always happy to hear that our efforts are producing beneficial results:

"Dear AOPA: Just a word to express my appreciation for the great help the Aircraft Owners and Pilots Association has been in our recent controversy with the public utility company . . . Although the utility company fully intended to extend a primary electric feeder line 30 feet in height directly in the path of our shortest runway, arrangements have now been completed to the satisfaction of both the St. Charles Airport and the utilities, due to the untiring efforts of AOPA.

"This is just another instance which proves that AOPA need not be located in one's home town to lend a helping hand to those interested in aviation." END

With Flagships landing on an average of once every hour instead of once in two hours and with pay loads 50% greater than in 1941, these U.S. Royal Airplane tires have a bigger job to do than ever before—and they are doing it!

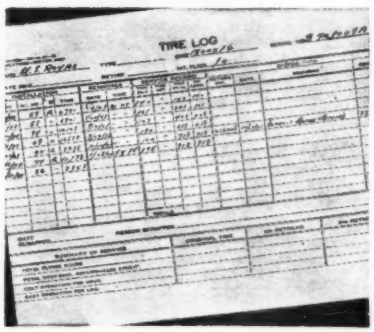
Life Line OF A U.S. ROYAL on the Flagship Fleet

Every tire that ever flew on an American Airlines Flagship has its own life line or Tire Log filed away where it can be referred to instantly. From the day that a 17.00 x 16 U.S. Royal Airplane tire is mounted on a Flagship until it is removed for recapping and finally discarded after having given its full service, the Maintenance Division of American Airlines keeps its life history hour by hour and plane by plane.

Even with the greater loads, the heavier schedules of today's air transport, American is getting an average of 3½ times as many landings from a single set of tires in 1944 as it did in 1941.

As synthetic rubber airplane tires with bodies of rayon replace natural rubber tires, the backlog of test experience already accumulated by American and recorded on Tire Logs will be of vital importance to airplane tire manufacturers. Benefiting from data like this, U.S. Airplane Tire engineers are finding new and better methods and materials to build lighter, stronger, safer tires.

In the Record Section of American's Maintenance Department, every tire has its own Tire Log. From the ship's log, the record clerk transposes each step in the tire's life from original installation to final removal.



This is the Life Line of a U.S. Royal that made better than 700 landings before it was sent to the "U.S." Tire Factory at Detroit for recapping. If the tire body is still in good condition, a new tread will be applied and the tire put back in service.

There is a Tire Log on file for every tire that ever flew on an American Airlines Flagship. From these records, data are supplied to airplane tire makers helping them to design stronger airplane tires to carry the greater loads of today and tomorrow.

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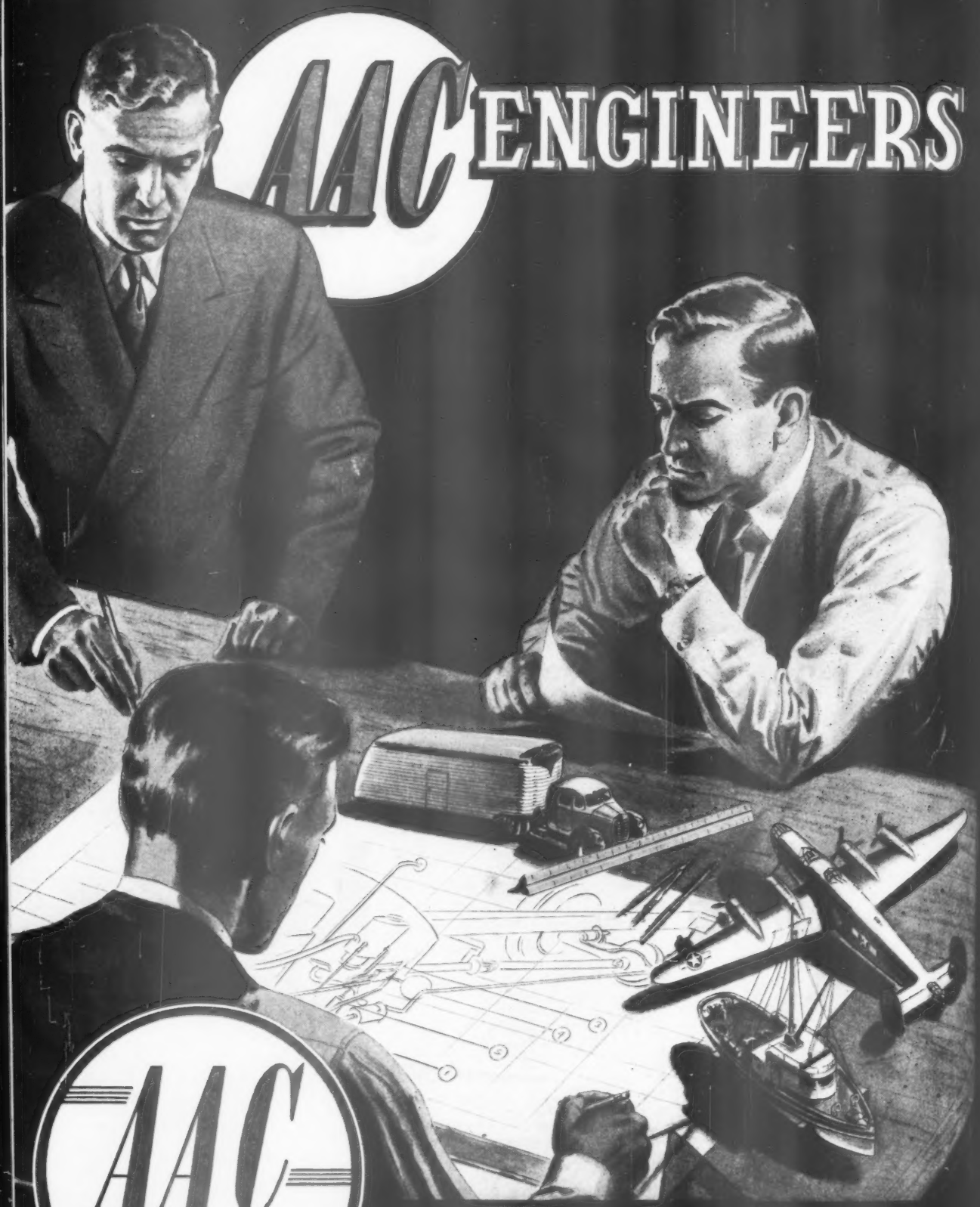

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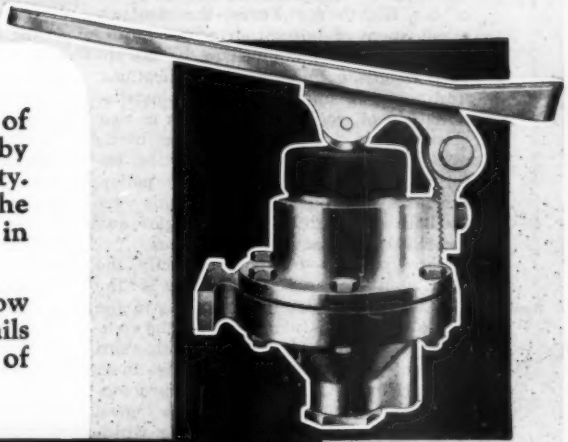
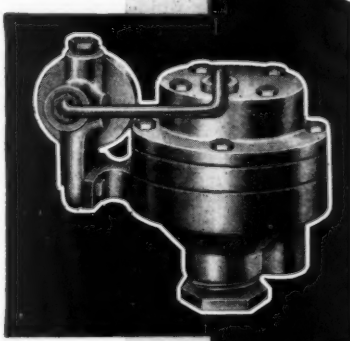




{Above} Treadle Type Air Brake Valve.

{Left} Relay Emergency Air Brake Valve.

{Below} Finger-tip Trailer Brake Control.

POWER CONTROLS DIVISION

BURBANK, CALIF.

(P-64)

ACCESSORIES CORPORATION

CONTROLS • PRECISION RADIO and ELECTRONICS

Air Tactics in France

(*Continued from page 25*)

Department entitled *"Command and Employment of Air Power."* This booklet sets up the following rules for the use of combat aircraft.

First priority is given to the establishment and maintenance of air superiority, a task which involves destruction of the source of enemy air power. In a word, the first step in the AAF air offensive was precisely the one taken in the activation of the Eighth Air Force--the strategic employment of existent air power.

Second priority is given to the disruption of hostile lines of communications, destruction of supply dumps and installations and of troop concentrations in rear areas. This "isolation" of given battle areas is a joint strategic and tactical enterprise. Consistent with AAF policy, the task was undertaken early this year by both the Eighth (the strategic) and the Ninth (the tactical) Air Forces.

Third priority—or, more correctly, the third step—in the AAF offensive is "the destruction of selected objectives in the battle area in the furtherance of the combined air-ground effort." It is this third phase of the air offensive that gave birth to the Ninth Air Force whose spectacular exploits, the AAF says, is the logical sequence in the use of air power which the field regulation booklet outlines.

The Ninth is a youngster. It was only on February 17, 1944, that General Eisenhower's headquarters announced that elements of the Ninth which had fought in the Egyptian and Tunisian campaigns were in Britain under the command of Lieut. Gen. Lewis H. Brereton. At that time the Ninth was the smallest air force in Britain. Within four months it became the strongest air force in the world.

It should be clear that an Allied victory required the destruction, for example, not only of factories which would, in six months, put 1,000 locomotives on rails in Germany and France, but the destruction of locomotives that already were in those countries. There was needed an air force which could live and maintain itself in the field, close to the troops. Such an air force had to be able to attack anything from a staff car to a railway yard, to silence a field gun at a few minutes notice, destroy a road used by a retreating enemy, or hit a tank which was holding up an infantry advance. That is why the Ninth grew so rapidly.

There are many things that differentiate the Ninth Air Force from the Eighth, the strategic air force here. But there is little to detract from the logical sequence of the use of both in winning the war. Only as one recognizes that sequence can he properly evaluate the effectiveness of tactical air warfare.

Of necessity, the Ninth is self-sufficient and self-mobile. It is the only air force to have its own engineering command equipped to build front-line emergency landing fields from which its fighter-bombers operate. It has its own air defense command to protect those air fields. Its service command, complete and self-contained, is sufficiently mobile to transport equipment either by land or sea and to move practically any repair or replacement parts to within shell-fire or even sniper range of the enemy. Besides its bombers and fighters-bombers, the Ninth has the largest force of *Skytrains* and American and British gliders in the world. These are the aircraft that flew thousands of paratroopers and airborne infantrymen into France five hours before the seaborne troops landed on D-day. Since then the *Skytrains* have done a less spectacular but equally important job of supply, evacuation of wounded, and transport of mail and equipment.

The Ninth fighters are divided into two tactical commands, one of which supports the American First Army and the other the American Third Army. It was recently announced that the Nineteenth Air Force is under the Ninth's command, presumably sharing in the type of operational activities for which the Ninth is famous. Both units fly the same equipment—*Mustangs, Lightnings and Thunderbolts.*

This, then, is the tactical air force that is backing up our Armies in France. Rather, it is the tactical air force *with* our infantry.

Its activities began months ago when the Ninth started operations from Britain with *Marauders* which once belonged to the old Eighth. Then *Mustangs* began arriving in the United Kingdom and the Ninth pioneered the use of these long-range fighters. After the *Mustangs* came two versions of the *Havoc*, one the glass-nosed bombardier version and the other solid-nosed with six forward-firing machine guns. Late in March, *Thunderbolts* and *Lightnings* went into operational work for the Ninth.

Preparation for tactical warfare began early in April and May. Fighter-bomber pilots studied new and improved old approach angles so that their objectives became equally vulnerable from zero degrees to an almost perpendicular dive. *Thunderbolts* were power-dived at amazingly steep angles and shallow-angle glides were developed into an entirely revolutionary method for planting delayed-action bombs.

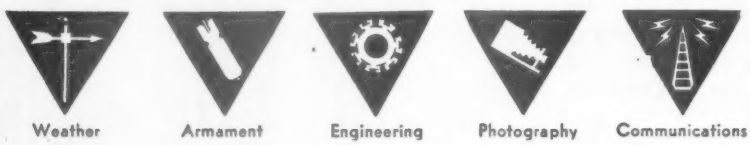
Meanwhile, huge fleets of *Skytrains*, towing gliders, roamed over England, practicing for the big day. Air training maneuvers, like those carried out by ground units, dwarfed anything ever before seen in warfare.

In May, the Ninth stepped up the joint air offensive, the second stage in the AAF planning. From May 1 to June 6, *Marauders, Havocs, Thunderbolts, Lightnings* and *Mustangs* flew more than 35,000 missions—more than 1,000 a day. These attacks kept the enemy guessing as to where the invasion armada would strike, while covertly softening Jerry's coastal defenses in the Cherbourg area. Every one of those 35,000 missions was directly connected with the invasion.

There were, for instance, a ring of German airfields within 50 miles of Paris to the north and west that would have based German planes to hit the invasion ships. In the five weeks before D-day, 85 bombing attacks were carried out on these Luftwaffe bases with *Marauders* smashing hard at hangars, repair shops, headquarters and barracks.

At the same time, the area of France which was to become the invasion battlefield was isolated. Bridges crossing the Seine and Meuse rivers became choice targets for the Ninth. On May 1 there were 13 important highway bridges and nine railway bridges crossing the Seine; by June 6 they had all been either completely destroyed or made unusable. In August the German 7th Army tried to

(*Continued on page 88*)



TECHNICIAN TAGS

THEY'LL be known by their sleeve patches is the gist of a recent War Department ruling which applies to all Technical specialists of the Army Air Forces. In design, the distinguishing patch is a 2½-inch equilateral triangle resting on its point. On this triangular background of ultra-marine blue are the gold designs which distinguish among the five group assignments of technical specialists—armament, communications, engineering, photography, and weather.

The AAF regulation calls for the sleeve patches to be worn centered on the right sleeve of the coat, field jacket, and shirt (when worn without the coat), with the lowest point just four inches above the lower edge of the sleeve. They are also to be worn on the left breast pocket of the fatigue uniform.

Only one distinctive sleeve patch is provided for each group assignment. All specialists within each of the five groups—which include some 80 different classifications—will wear their particular group insignia.

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**This catalog was printed during the early stages of the war, and while it is obsolete in minor respects, the basic information it contains still applies to present and future conditions in aviation.*

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(*Continued from page 84*)

escape across the Seine on the way back to Germany. What happened to that Army was largely due to the bombing carried out before D-day by the Ninth Air Force.

D-day was a busy one for Ninth pilots. There were three chief jobs for that day which marked the purest tactical employment of air power.

1. At 0050 hours the first of a 200-mile procession of troop-carrying *Skytrains* and gliders dropped men on the Cherbourg peninsula. At dawn this unarmed fleet still was pouring men into the thick of German defenses.

2. *Marauder* crews which had been briefed at 0200 hours, moved off at dawn in a driving rain to hit German coastal guns before the seaborne troops landed. Eight waves of medium bombers, each carrying 16 250-pound bombs, battered the big guns from 4,000 feet as our first landing craft approached the shore.

3. As the movement of troops continued, *Lightnings* patrolled the Channel and *Thunderbolts* circled over the landing points. Other fighter-bombers probed far inland to block roads, silence guns, blow up radio and power stations and keep German reinforcements from moving up.

Since D-day, our Army's major moves toward Cherbourg, Caen, St. Lo—and the breakthrough to Paris—were preceded by these same methodical bombardment and strafing attacks by the Ninth Air Force and the RAF'S Second Tactical Air Force.

In the first week after D-day, Ninth fighter-bombers attacked more than 1,000 specified enemy targets in addition to making hundreds of unrecorded individual attacks on railway trains, staff cars, and on troops in camps, convoy, hedgerow positions, and forward observation posts. Until the weather closed in—the worst storm in 20 years hit the invasion coast the week after D-day—the tactical pilots were averaging more than 100 individual attacks an hour on permanently-established German defensive lines prepared months before.

As soon as there was room for them, the fighter-bombers moved to bases on the continent. These airfields had been constructed hastily by Ninth Air Force engineer units whose work started on D plus 1—under artillery and sniper fire—building the first emergency landing strip in France. *Thunderbolts* of the Ninth flew from a refueling and re-arming strip in Normandy on June 13, marking the first scheduled flight of Allied warplanes in France. Simultaneously, *Skytrains* loaded with complete staffs of surgeons, nurses and medical technicians moved to the "far shore" to initiate the first aerial ambulance service of the war.

FLYING

"Say Joe, where's the major taking his nap?"

You've read about German fuel shortages. Here is some history:

On the same day as our aerial ambulance shuttle service inauguration, June 13, the first of a series of pinpoint attacks on a trio of large fuel dumps at Domfront, 40 miles southwest of Caen, was carried out by *Marauders*. The Nazi panzer units operating against the British 7th Armored Division in the Caen area were actually drawing fuel from these dumps which, it was later revealed, contained a sufficient quantity to supply 12 enemy divisions. These same dumps at Domfront, as well as a huge store of fuel hidden in trenches and underground tanks in the Foret d' Andaine, were blasted on June 15 by *Marauders* and *Havocs*. In fact, during the latter part of June and early July our bombs hit the German depot in the Foret de Conches, 40 miles southwest of Rouen, another in the woods near Senoches, others at Bruz, Rennes and in the Foret de la Guerche. The fuel offensive is still on. Prisoners of war testify that panzer companies are abandoning their vehicles and marching as infantry, of armored units stealing gas from the Luftwaffe, of regiments on foot and bicycle because they had no gasoline for their vehicles.

During the advance on Cherbourg, Army and Air Forces officers worked out —for the first time in the European theater—a plan whereby ground forces suddenly in need of air support could obtain it immediately from a pool kept "on call" at nearby strips. Such requests are passed on to the strips through a centralized channel that permits the air commander to approve or reject them. If his approval is granted, the planes get to the point of call in an amazingly short length of time.

Here is a picture of the fighter-bombers at work on tactical objectives. On June 22, at 1300 hours, the first of more than a dozen waves of planes, flying 48 abreast, struck from west to east just below Cherbourg to bomb and strafe all German gun positions, encampments, supply depots, ammunition dumps, pill-boxes and all mobile and fixed artillery units they could find in line of march of the advancing First Army. They were directed by smoke signals from our own forward troops.

Striking the three miles of German defenses between Cherbourg and our frontlines, fresh, fighter-bomber formations completely blanketed the area with flights zooming overhead every five minutes for an hour. Some of the toughest strongpoints ever encountered, consisting of massive concrete stockades surrounded by high rock walls and mid-Victorian moats, virtually invulnerable to ground attack, and huge pyramid-shaped forts of steel-reinforced masonry were among the targets destroyed.

At 1400 hours, *Marauders* and *Havocs* began flights at five-minute intervals over the area to attack even stronger positions which had not been hit by the fighter-bombers. This phase of the battle coincided with a powerful artillery barrage from the ground troops.

All this adds up to the reason why Cherbourg fell—and the same story could be told concerning dozens of other similar

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points that have fallen to us since then.

Typical of the emergency missions carried out by the Ninth was their assignment on July 27. The First Army had been held up south of the St. Lo-Periers road and air support was needed. *Marauders, Havocs* and fighter-bombers were ordered to bomb rectangles. Some of the aircraft were armed with fragmentation bombs and other small general purpose missiles. Others were assigned to area bombing and the remainder were told to hit specific targets at crossroads or inside villages within their rectangle.

The area attacked on that day was about five miles long and a mile wide, and was due south of a similar rectangle which had been attacked by heavy bombers of the Eighth Air Force. The operations had the desired effeect—within a matter of hours two First Army armored columns had pushed forward 12 miles. Coutances fell to our forces soon afterward.

It would be next to an impossible task to chronicle the daily activities of our tactical air forces in France. Almost hourly come releases like these from their headquarters:

"On the afternoon of August 1 more than 300 *Marauders* and *Havocs* were dispatched to attack bridges across the Loire and Seine rivers with effective results."

The toll of destruction also included 69 motor transports, three staff cars, 18 horse-drawn guns and 28 horse-drawn carts. Troops, guns, and roads in the battle-zone were hit. Thirty-eight German tanks and armored vehicles were destroyed.

"Widespread and frequent attacks upon railway targets between Le Mans and Tours have netted a total of 140 railway cars destroyed; four locomotives destroyed and tracks were cut in 21 places. *Lightning* and *Thunderbolt* fighter-bombers also bombed enemy fuel dumps at Flers, Tours, Rennes and Laval. Huge fires were reported."

The strafing of roads in France has brought even more spectacular results. Originally the Germans moved divisions over roads at 30-yard intervals, day and night. Then they moved onto side roads and soon restricted movements to nighttime. Today they go only with aircraft lookouts posted on every vehicle.

Staff cars, half tracks, buses, motorcycles and tanks litter the roads in an indescribable jumbled mass, the dead lying in ditches where the *Thunderbolts* left them. The roads are so cluttered that American bulldozers have been called up to clear the wreckage into the fields.

These low level attacks by fighters and fighter-bombers—especially those carrying rockets—have frayed Nazi nerves to the breaking point. Maj. Gen. E. R. Quesada, commander of the Ninth, credits his air force with the creation of conditions behind enemy lines that are unbearable. "No army can stand it;" he says, "the combined and co-ordinated effort is getting the Germans down."

Just how demoralizing the air blitz has been is indicated in reports of wholesale surrender of ground troops to flying squadrons. Recently a *Thunderbolt* squadron "captured" more than 300 Nazi soldiers. Operating over the German lines the squadron came upon a group of enemy troops standing on a road. One was waving a white flag. Wheeling over the group the airmen headed in the direction of the American lines, waggling wings as a signal for the Germans to follow. They marched off in columns of four while the *Thunderbolts* maintained patrol overhead until American soldiers, summoned by aircraft, came out and took them in tow.

On another occasion, a fort that had been subjected to considerable bombardment by land-based field artillery and 155-mm. guns, surrendered immediately after fighters dropped 500-pound bombs on the installation.

The prisoners themselves give the clearest picture of the effectiveness of the air strikes. They report that dive bombing and strafing are more destructive of morale than level bombing, that German officers are unable to hold their formations together under dive-bombing and strafing attacks.

Armed reconnaissance by bomb-laden and heavily-armed fighters, and radiophone co-oordination between ground forces—especially armored units—and the air, have constituted one of the principal techniques of their recent successes.

Summarizing their efforts, high-ranking ground force officers credit the Ninth with providing the finest air-ground co-operation in the history of warfare. General Bradley, American ground force commander, says: "We could not have achieved what we have if it were not for the Ninth Air Force." And that terse comment on this final phase of the AAF drive into Europe applies equally well to every step of its plan which was put into operation back in August, 1942. END

Toward Simpler Air Rules

(*Continued from page 55*)

and logged at least five take-offs and landings to a full stop in an aircraft of the same type and class.

For instruction and instrument flights, the recent experience requirements are retained and, in the case of instrument flying, they apply also to solo flights.

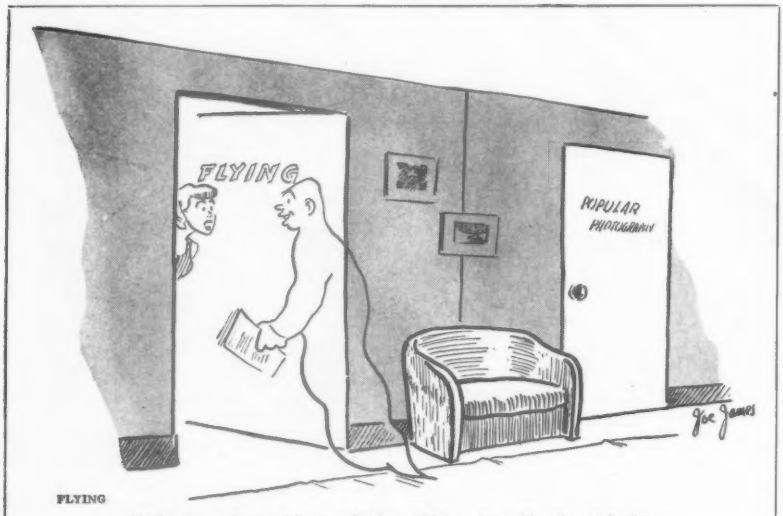
4. *Acrobatic flight.* The present provisions of the CAR requiring that pay passengers must not be carried and that each occupant of the aircraft must be equipped with a certificated parachute when performing intentional acrobatic maneuvers, have been retained. The desirability of retaining these requirements, Mr. Lankford said, had been expressed by a large majority of persons who commented upon their deletion from the suggested revision of Part 60.

The Bureau has also contemplated the establishment of a personal aircraft category to be distinguished from aircraft operated for hire and to be known as NP aircraft, designating such planes for personal use only. The NP category would be in addition to the NC, designating aircraft airworthy for all commercial service, NR, certificated for some particular types of operation, and NX, certified for experimental operations—generally factory aircraft in process of getting an NC rating.

The chief advantages of such an arrangement appear to be that the private owner would not have to abide by the inspection rule governing NC aircraft—an inspection every 100 hours—and would also be relieved of the necessity of keeping a logbook.

The NP category seems to have become a "dead duck," however, as comments from pilots showed that there was no particular interest in it, since in order to keep their aircraft airworthy—and they would still be required to do this—inspections are necessary. Most pilots said that the keeping of logbooks was desirable.

(*Continued on page 94*)



"Who buys those 'I Learned About Flying from That!' articles?"

THESE are cylinders. These are beginnings—the start of a mightier machine than even war built. For it was the American Machine of Industry that built the American Machine of War—and its greatest job will be tomorrow: building a new world of Peace and Prosperity. It will be the most gigantic task man ever faced and it is as important in its details as in its conception.

The four plants of The Weatherhead Company have produced industrial parts such as these at the rate of millions every week. When Peace is restored we will continue to make cylinders—and scores of other industrial necessities—as our part in the rebuilding of tomorrow's great peacetime world.

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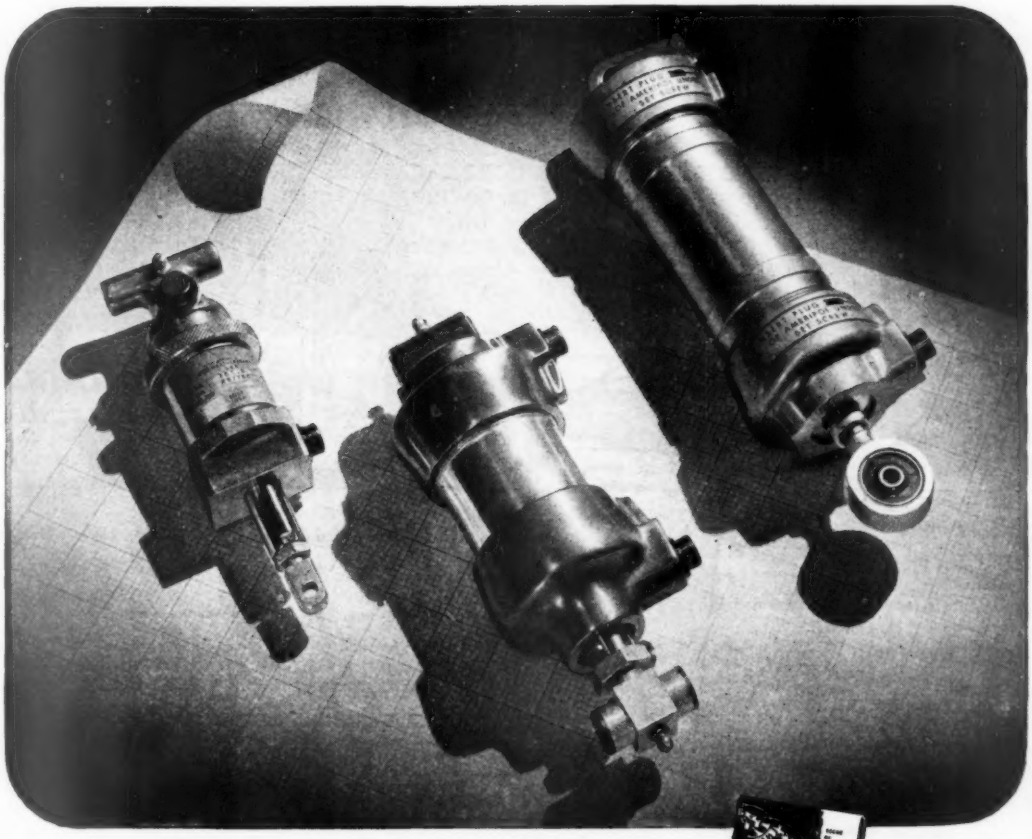
Beginnings OF TOMORROW'S WORLD!



FREE: *Write on company letterhead for "Seeds of Industry"—a history of The Weatherhead Company, its facilities and products.*

LET'S GO PLACES IN A PIPER CUB PLANE
I'M READY FOR MY FIRST LESSON
This is the first of a series of ads showing how to fly a Piper Cub plane. Cut out this page and keep it with the others that follow.
by HAWLEY TURNER
FIRST, MARY, WE PUT ON THE BRAKES - THEN START THE ENGINE, OPEN THE THROTTLE AND CHECK THE INSTRUMENTS.
NOW WE HEAD INTO THE WIND, EASE THE THROTTLE WIDE OPEN, HOLD THE STICK FORWARD UNTIL WE'RE GOING FAST ENOUGH TO TAKE OFF.
STICK IS STRAIGHT UP, THROTTLE WIDE OPEN.
STICK FORWARD TO RAISE TAIL.
STICK BACK TO TAKE OFF.
STICK STRAIGHT AGAIN 'TIL SPEED IS GAINED.
STICK BACK FOR CLIMB.
AT THE START
FASTER
FLYING SPEED REACHED
LEVEL OFF FOR EXTRA SPEED
ENOUGH SPEED TO CLIMB NOW
WE HAVE CLIMBED FAR ENOUGH. NOW WE TURN TO THE LEFT - SEE HOW EASILY THE CUB HANDLES!
SURE DOES, TOM - EASY AS DAD'S CAR!
I'LL SET 'ER DOWN THIS TIME. LATER I'LL SHOW YOU HOW.
IT ALL SEEMS SO SIMPLE.
YOU'LL LEARN IN NO TIME!

GET YOUR "HOW TO FLY" BOOKLET

New booklet, "How to Fly a Piper Cub," covers the fundamentals of flying with over 50 step-by-step photos and descriptions. Many other facts, full-color pictures of Piper Cubs. Send 10c in stamps or coin for postage-handling. Write Piper Aircraft Corporation, Dept. PA114, Lock Haven, Penna.

IS YOUR TOWN READY TO FLY?

It should plan landing facilities now—for its citizens and its future. The booklet, "What Your Town Needs for the Coming Air Age," illustrates various types. It covers benefits, where to build and how to start. For your free copy, write Piper Aircraft Corporation, Dept. PA114W, Lock Haven, Pennsylvania.

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PIPER "PLANE QUIZ"

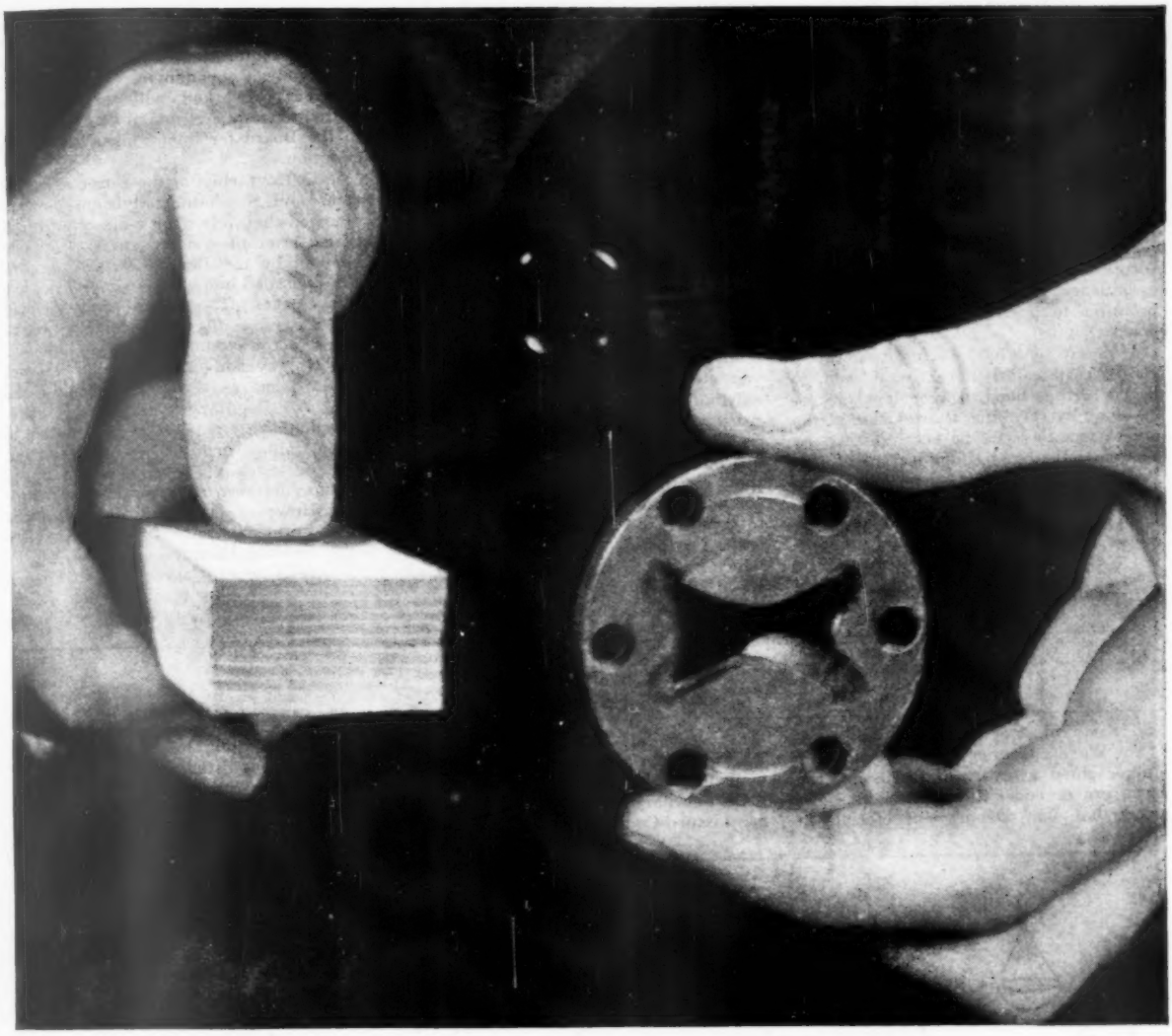
1. How long does it take to learn to fly a Piper Cub?
   8 hours instruction required before soloing.
2. How much will a peacetime Piper Cub cost?
   About the same as a medium-priced automobile.
3. How much gasoline and oil does a Piper Cub use?
   Less than the average automobile.
4. How much space does a Piper Cub need for landing or taking off?
   A strip about 100 feet wide and 1,800 feet long.

NOTE—These lessons obviously can explain only the fundamentals. See your Piper Cub dealer for actual flying instruction. Write us what "Plane Quiz" questions you would like answered.

PIPER AIRCRAFT CORPORATION—LOCK HAVEN, PENNA.

PIPER CUB

Points the Way to Wings for ALL Americans



Like a square peg from a round hole . . .

You have to know what rubber will do before the die is cast

ONE GUN TURRET leaked when it rained until a special sealing strip was developed . . . *and extruded.* The odd shape of the seal was engineered by men at B. F. Goodrich who have been solving problems like it—*with extrusions*—for dozens of aeronautical applications.

"Extruding" is a process where rubber—natural or synthetic—is pressed through precision dies to emerge in a desired shape and form. Designing these dies requires careful engineering planning due to the peculiar flow characteristics of the rubbers used. As shown above, dies often look a lot different than the strip that comes through them.

Another important factor in successful extruding is a thorough understanding of both natural and synthetic compounds. For when compounds change, the shape of the extruded piece may change, due to differences in the amount of swell. Dies must be revised to allow for these differences. You have to know rubber—what it will do and how it will flow—to make successful extrusions.

Although B. F. Goodrich dies already available cover thousands of different shapes, each new application is studied to be sure that the best results are obtained. If a custom-built die is needed, blueprints are made and the special shape is produced.

The applications of extruded seals are practically unlimited. So if you have any problem that you think might be solved with a ring, tube, strip, or packing, write to *The B. F. Goodrich Co., Aeronautical Division, Akron, O.*

Skyway or Highway

B.F.Goodrich

FIRST IN RUBBER

(*Continued from page 90*)

However, the two advantages that would be achieved through establishment of the NP category will probably be accomplished anyway through different means.

In the first place, relaxation of requirements with regard to NC aircraft are under consideration, one proposed change permitting plane owners to make minor repairs and adjustments without being supervised by mechanics.

Also, the new "odometer," a device to record the running time of engines, much as mileage is recorded on automobiles, promises to lead to elimination of logbooks. By using an odometer and having repairs, etc., entered in aircraft operating record certificates, there would seem to be no further need to keep logbooks.

Generally speaking, the revision of the operation rules will be accomplished by reorganization and simplification of language but there will also be elimination of unnecessary and petty regulations.

An example of an unnecessary rule which has been eliminated in the proposed revision is the requirement that no aircraft should take off without sufficient fuel to reach its destination. Also eliminated is the provision that an engine may not be started unless a competent operator is at the controls.

Regulations pertaining to proper placement of NC marks on planes were removed from CAR sections pertaining solely to pilots. It is felt that these rules and the specifications as to types of lettering that should be used are only confusing to pilots, inasmuch as the marks are placed on the planes by the manufacturers or mechanics.

An example of the proposed simplification of rules is contained in the new 43.401 which states: "Any person piloting an aircraft in the United States must hold a valid pilot certificate issued by the Administrator or a foreign pilot certificate validated by the Administrator." The existing rule takes four times as many words to say the same thing.

Closely related to the revision of the operation rules is the traffic rule proposal that weather minimums under which contact flights are permitted be changed to give consideration to all types of aircraft, ranging from the slow helicopter, which might fly in low visibility, to high-speed aircraft.

The suggested revisions of the three Parts, 20, 60, and 43, after being circulated separately to industry, pilots, and others who are interested, will be re-written after analysis of comment. The three sections, as re-worked, will again be submitted for public comment before they go to the Board for final consideration and adoption.

R. D. Hoyt, chief of the Bureau's safety rules and regulations division, has announced that, following a six-month trial period after the revised rules are finally adopted by the Board, Parts 43 and 60 will be issued in a handy pamphlet of five or six pages. These two sections should tell the pilot all the Federal rules he needs to know when flying.

When revision of the regulations was begun, fears were expressed that if the Civil Air Regulations were cut or simplified, they might not be acceptable to many state aeronautical commissions and that the states might write widely divergent regulations for operations and traffic. However, the state organizations have enthusiastically favored the revisions and simplification.

There is general agreement that flying has become a "big business," and small-time rules no longer fit. END

Planes vs. Battleships

(*Continued from page 43*)

and Kelly did not live to report.

The War Department and the Army Air Forces shied away from discussing the issue pro or con. It was obvious, however, that War Department officials in Washington also were not sure the *Haruna* or one of that class actually had gone to the bottom.

On February 27, 1942, the War Department issued Communiqe No. 127, in which a tabulation of Jap losses was given. No battleship was listed as sunk, though one was listed as "probably sunk."

"I think our artificial horizon is on the blink again!"

Another milestone in the progress of sea-air warfare occurred off Malaya on December 10, 1941, when Japanese torpedo planes and bombers sent to the bottom the British dreadnoughts *Repulse* and *Prince of Wales*.

Over-enthusiastic airmen hailed this incident as the end of the battleship, but more conservative elements in both the Army and Navy insisted that it was not a true test. Navy men insisted that in modern warfare battleships would never be left without air escort as were the two British vessels.

Best indication of the increased firepower of the modern battleship were the facts disclosed after the U.S.S. *South Dakota* destroyed 32 attacking Jap planes in the battle of Santa Cruz in the South Pacific in October, 1942.

In his report on the action, Capt. (now rear admiral) Thomas Leigh Gatch, skipper of the battleship, said that in one attack 40 Jap torpedo planes and dive bombers attacked the American task force. The *South Dakota* and other ships threw up a wall of antiaircraft fire and a few minutes later all but one of the planes turned away or were down in flames. One torpedo plane headed for the *South Dakota*. Gatch reported:

"It came at the stern of the ship. It appeared that millions of tracer shells went right past that plane without hitting it, but some did strike it, and at the right time. They struck just before the pilot released his torpedo. The plane was jarred out of its line of flight and its torpedo was released well up in the air. It seemed that the torpedo would drop on the ship, but it passed over the fantail

...proves superiority of General's Tail Wheel Tire-Tube-Wheel Combination!

Quoting: R. L. ANDERSON, Superintendent of Engineering, CHIGAGO and SOUTHERN AIR LINES

"A series of tests have progressed to a point where Chicago and Southern has been able to determine that the General Tire and Wheel combination is superior to the installation formerly used on the company's 21-passenger Douglas DC-3 transports."

The General Tail Wheel Tire-Tube-Wheel combination has consistently proved its superiority in laboratory tests and in actual service by leading users. In one package, ready for quick installation, it brings you General's famous *Top-Quality*—safe, dependable performance—exclusive design features. Immediate delivery is available. For further information, write or wire:

AVIATION DIVISION

THE GENERAL TIRE & RUBBER CO. • AKRON, OHIO

and fell into the sea on the other side aft. The plane's wings were shot off. It struck the water and sank."

Rear Adm. H. G. Bowen, special assistant to the undersecretary of the Navy, recently gave an idea of the increased firepower of modern battleships when he said that the weight of steel thrown had been boosted 100 times over what it was three years ago.

Most curious angle in the developments to date is the fact that only the Japanese in World War II have actually succeeded in sinking a battleship by employing air power alone, and they did so only in the early stages of the conflict when America and Great Britain were woefully unprepared to meet such an assault.

In addition to the *Haruna*, which remains a question mark because of official silence, the American Navy has claimed the sinking of only two Japanese battleships, and those two went down off Guadalcanal under pounding by warships and planes.

The ships in question were Kongo-class battleships, old types, and they were crippled in night sea battles November 13-15. One of these remained practically dead in the water within sight of Guadalcanal the day after the battle.

During the daylight hours, land-based U. S. torpedo bombers roared over the smouldering hulk all day, hitting her with torpedoes and bombs. The following dusk she still was afloat and she disappeared sometime during the night. She was sunk, but only the Japs know whether they finally helped her go to the bottom to prevent her being towed to port by American ships.

In the Battle of Midway in June, 1942, American carrier-based planes and Army bombers sent four enemy carriers to the bottom as well as destroyers and cruisers, but the two battleships in the armada were merely listed as damaged.

Following the Battle of Guadalcanal, the main units of Japan's fleet went into hiding so that no clear-cut American test could be made by carrier or land-based planes.

Meanwhile, the American Navy began to boast, and rightfully so, about its own "invulnerable" new battleships which bristled with antiaircraft guns from stem to stern.

Despite the increased armanent there is always a possibility that one of the attacking planes will get through to its target. That happened in the Battle af Santa Cruz in which the *South Dakota* was hit, but the blow was not serious because of the increased armor on modern warships.

One dive bomber got through despite the antiaircraft and Gatch was on the bridge. The plane dropped a 500-pound bomb and Gatch later said that, as he watched it fall, he hoped it would strike a turret instead of the deck. It did strike a 16-inch gun turret and barely made a dent in it. Gatch was injured by a flying splinter. The damage was repaired and the *South Dakota* was back in action a few weeks later.

Significantly, no major American fleet units have been lost to Japanese air power since the *Hornet* was crippled in the Santa Cruz battle and had to be sunk by escorting American warships to prevent capture.

Since then, however, the addition of aircraft carriers to America's fleet has increased the protection to task forces and these have roamed boldly within striking distance of land-based Jap planes at such mighty bases as Truk, Palau, the Marianas and the Bonins.

Since those early days, America's fleet has become the most powerful in the world. U. S. Naval officers have learned to combine sea-air forces with devastating force undreamed off by the Japanese or anyone else.

the British Say . . .

The Douglas DC-7 is expected to be powered with 3,000-h.p. radial air-cooled engines, a new design of Pratt & Whitney . . . A single-seat fighter similar to the Bell *Kingcobra* (P-63) is reported to have been built for the AAF by Curtiss . . . The Vought *Corsair II* (F4U-2) has square wing tips, about four inches having been clipped off each wing . . . Now that production of *Catalinas* has stopped at Consolidated's San Diego factory, it is expected that the Consolidated B-32 will be manufactured there . . . Lockheed *Lightnings* and North American *Mustangs* of the 15th Air Force are reported to be operating in the Lvov region in Russia . . .

—*The Aeroplane*

• • •

The Douglas *Invader* (A-26) is powered with two 2,000-h.p. 18-cylinder Pratt & Whitney *Double Wasp* R-2800 air-cooled radial engines . . . The Fairchild C-82 has two 1,600-h.p. R-2800-51 *Double Wasps* . . . The B-24J differs from the B-24H in that it has a Consolidated nose turret. The B-24-H has an Emerson nose turret. The engines of the B-24J are Pratt & Whitney R-1830-S4C4-G *Twin Wasps* . . . The Northrop *Black Widow* (P-61) night fighter is equipped with air-borne radar. Its span is 66 feet, length, 48 ft. 11 in. . . . These figures are quoted for the Boeing *Superfortress* (B-29): range is 1,000 miles with 17,500-pound bomb load, over 3,000 miles with about 6,000 pounds; gross weight, about 120,000 pounds; maximum speed over 300 m.p.h., cruising speed about 250 at 25,000 feet, normal range over 3,000 miles . . .

—*The Aeroplane Spotter*

As powerful American task forces began to roam deeper and deeper into Japanese-controlled waters, they demonstrated beyond a doubt that the U. S. Navy had learned how to strike a smashing blow at the enemy while protecting its various units from damage.

Japanese land-based bombers failed to inflict more than scratches against American warships when U. S. task forces struck for the first time at such hitherto "invulnerable" bastions as Rabaul, Truk, Saipan and Palau. American carrier-based planes and ship antiaircraft took a terrific toll of Jap planes.

The secret of America's success in repelling air attacks at sea was explained by Rear Adm. W. H. P. Blandy just before he left his post as Naval ordnance chief to assume a command at sea. He said:

"While the defense of our Naval ships against aircraft is not perfect, and cannot be made so, its striking improvement has enabled our commanders at sea, in pursuit of their objectives, to expose their ships to enemy air attack upon many occasions, even when fighter defense either was not present or was inadequate to the task of furnishing complete cover.

"The American Naval ship's antiaircraft defense is what you might call a defense in depth. The attacking planes first experience the heavy blows delivered by the five-inch gun which, with its rapid rate of fire, its superb fire control system, and its deadly projectiles with their accurately timed fuses, constitutes the outstanding Naval antiaircraft battery in the world.

"Next comes the 40-mm. battery, firing explosive two-pound projectiles with terrific volume of fire due both to the large number of guns mounted and to the high rate of fire. Any planes that survive the first two batteries are subjected to a murderous hail of explosive quarter-pound bullets from 20-mm. guns.

"Attacking against such defense, even such planes as are not shot down or badly damaged have little chance of dropping their bombs or torpedoes with any degree of accuracy, so that you get your defense."

Blandy's statements were made before the American task force strikes against Truk, Saipan, and Palau, but they partly explain the success of those assaults.

In the Truk assault, the carrier-based planes knocked out Japanese air defense the first day and on the second day warships were able to move in close enough to blast enemy ships attempting to flee the bomb-battered atoll.

The task force that hit Saipan was spotted by Jap reconnaissance planes 24 hours before it reached its objective, but the American commander was so confident that he proceeded.

In this action, Jap torpedo planes and dive bombers attacked the American carriers, battleships, cruisers and other vessels throughout the night but failed to penetrate their antiaircraft defenses.

A similar situation prevailed when the greatest armada of the war sailed within 500 miles of the Philippines to hit Palau. Units of the Jap fleet that were present at Palau and Yap fled westward when enemy planes saw the American force approaching.

Many sea and sea-air combat problems may be settled if the Japanese high command ever decides to risk its remaining fleet units in a showdown battle. However, the chances of a test of strength are becoming more and more remote unless the U. S. Pacific Fleet succeeds in cornering the surviving Jap warships.

America has more than 1,000 warships and by the end of this year 581 more will

(*Continued on page* 100)

"Not even Joe could hurt it!"

There's one in every squadron. The kid who has two left hands of five thumbs each, and as much mechanical aptitude as a mule . . . yet craves to be a mechanic!

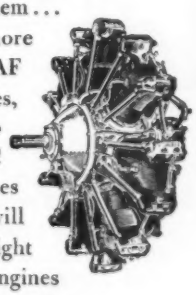
When Joe wanted to take down a motor on his own time—for practice—somebody said "Let him play around with the Jacobs. Not even Joe could hurt it" . . . which is straining the truth slightly. Joe, or anybody else who doesn't know how, can raise hob with a Jacobs. The tolerances on the Jacobs are as fine as on any aircraft engine, and assembly or dis-assembly needs expert knowledge and a delicate touch.

But because the Jacobs is simple in its structure, has all its parts easily accessible, crew chiefs find that green hands can become proficient working on the Jacobs in less time than any other engine in service requires.

A DECADE of development went into the Jacobs before the AAF got it . . . and that decade has paid big dividends in the AAF training program. The service period of 350 flight hours between major overhauls has gradually been extended as high as 1050 hours! One major overhaul instead of three, with lowered maintenance time and costs! And fifteen student pilots trained per overhaul—instead of five! . . .

Remember, too, that training operation, with hard student handling, frequent take-offs and landings, gives the engine more wear than most engines get in combat or commercial service.

So the Jacobs engines not only give a better break to GI Joe, who takes care of them . . . but to students and instructors, in more hours of dependable service . . . to AAF administration, in full flying schedules, higher output of pilots . . . and to taxpayers, in lower maintenance costs!



Largest maker of aircraft engines in the medium power class, Jacobs will have new postwar models . . . for light planes and medium transports . . . engines that may be the basis of profitable peacetime operations! . . . Inquiries invited . . . Jacobs Aircraft Engine Company, Pottstown, Pa.

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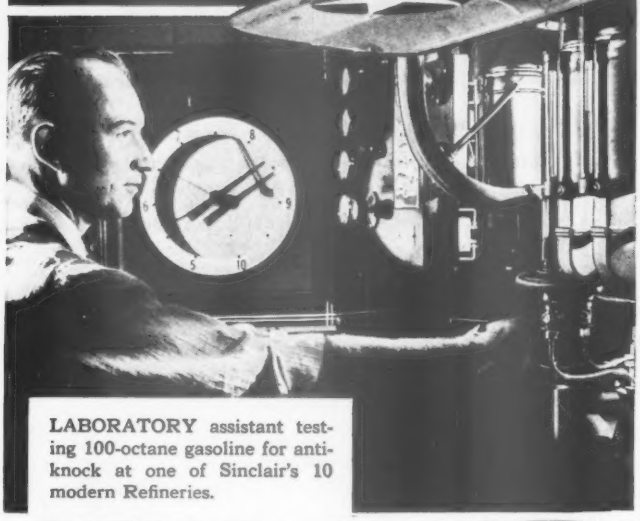
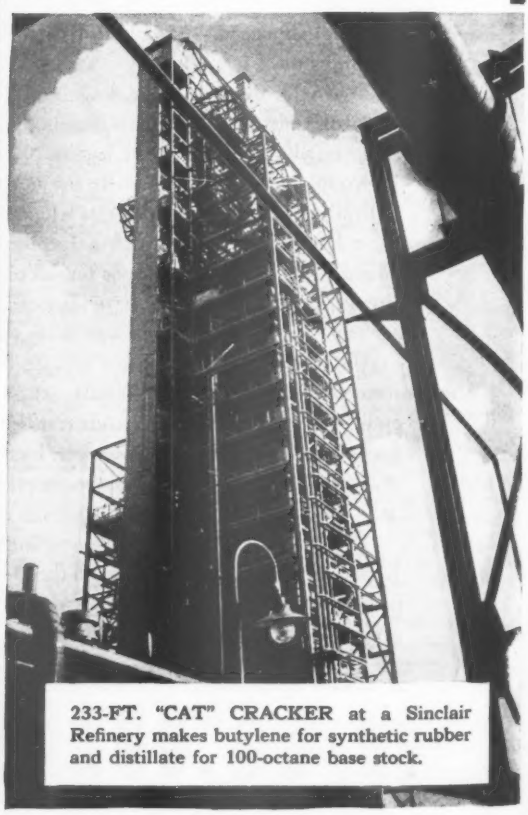
SINCLAIR 100-OCTANE fuels 3000 fighters daily

Official U. S. Navy Photo

3000 FIGHTER SORTIES every day, protecting Yank bombers . . . maintaining air mastery . . . can be flown with the daily output of Sinclair 100-octane gasoline. Today, all of this 100-octane goes to fighting fronts. Tomorrow, Sinclair Aviation Gasoline will power the nation's commercial and civilian planes.

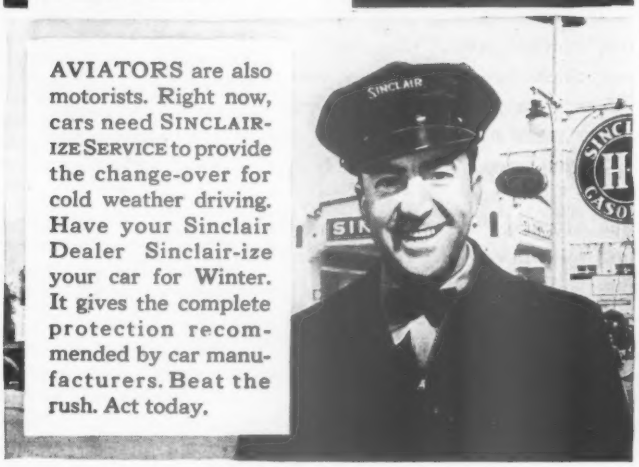


LABORATORY assistant testing 100-octane gasoline for anti-knock at one of Sinclair's 10 modern Refineries.



233-FT. "CAT" CRACKER at a Sinclair Refinery makes butylene for synthetic rubber and distillate for 100-octane base stock.

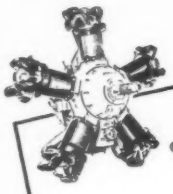
AVIATORS are also motorists. Right now, cars need SINCLAIR-IZE SERVICE to provide the change-over for cold weather driving. Have your Sinclair Dealer Sinclair-ize your car for Winter. It gives the complete protection recommended by car manufacturers. Beat the rush. Act today.



P.S.*

Postscript to the purchase and maintenance of any aircraft is the availability of engine • • •

IMPORTANT



...*PARTS AND SERVICE

Right there is where Kinner really moves out in front. For, Kinner parts and service are *always* available. Not since the company built its first 3-cylinder engine 25 years ago has a Kinner ever been orphaned. Genuine Kinner parts are as close as an air-mail letter or wire. Kinner service is standing by, ready to help keep engines operating economically, keep planes in the air.

Kinner OMO* manuals are available—there's a new one just out on the R-56 engine. Kinner backs up aircraft owners and operators with a sound service and repair policy. Put your postwar flying on a sound basis with engines that are dependable and economical. Install Kinners—be sure you can *always* get engine parts and service. KINNER MOTORS, INC., Glendale, Calif., U.S.A.

*Operation, Maintenance, Overhaul

Send for your copy of "Ode to Perseverance." Story in verse of an engine at war with a world at war.

BUY WAR BONDS

Kinner

1919—BUILDERS OF DEPENDABLE AIRCRAFT ENGINES FOR A QUARTER CENTURY—1944

(*Continued from page 96*)

be added. The Navy recently revealed that America now has 14 *Essex*-class carriers, nine of the *Independence*-class and at least 70 escort carriers.

Recently, Adm. Ernest J. King, Commander-in-Chief of the U. S. Fleet and Chief of Naval operations, bemoaned the fact that it has been impossible to stage a major sea battle because of "lack of Japanese co-operation."

This is undoubtedly the crux of the whole battleship vs. airplane controversy. Since the early days of the war, battleships have refused to "co-operate" by offering themselves as targets for aircraft. The aircraft has created an entirely new method of using the fleet in battle.

The battleships no longer fight alone but as part of the battleship-carrier team. The carrier itself has become the capital ship and the battleship, in a way, an auxiliary. In the carrier-battleship team, the battleship is a floating gun platform whose cannon protect the carrier from air attack in exactly the same sense that the carrier is a floating landing field whose fighter planes protect the battleship. Both work together; each is indispensable to the other.

The historic purpose for which battleships came into being—slugging it out with the heavy fighting ships of the enemy—has yet to be fulfilled in this war because the carrier, as the capital ship, has been able to transport bombs at ranges far beyond the 16-inch guns of the battleship.

Given the carrier-battleship team, each indispensable to any defending the other, the question of planes vs. battleships becomes two questions:

First, under ideal conditions can planes sink battleships?

Second, under battle conditions, are they likely to?

America's new battleships have heavy armor plate. They are extensively compartmented. They can take a terrific aerial pounding without being mortally wounded. But even so, there are probably no Naval experts who would expect them to stay afloat indefinitely in the face of continuous heavy aerial attack.

Put a World War I battleship such as the *Ostfriesland*, without modern armor or compartmentation, out in the Atlantic Ocean, dead in the water and undefended by antiaircraft or carrier-based planes and you have a sitting duck. Take a modern warship, able to maneuver rapidly and protected by extremely heavy and accurate antiaircraft fire from its own and other fleet guns, and by carrier-based planes, and you do not have a sitting duck.

It seems, then, that to the question: "*Can* planes sink battleships?" the answer must be an unqualified "yes."

To the question: "*Are they likely to* under battle conditions?" the answer is "possible but unlikely."

Barring luck, planes will sink battleships only when one side has overwhelming air power within striking reach.

This was the situation at Pearl Harbor when we did not have either our antiaircraft alerted or plane protection for our battleships. It was the situation off Malaya, when the *Prince of Wales* and the *Repulse* did not have air support. And it may be met again when our fleet drives the Jap fleet into its last desperate corner in the Pacific. END

Air Traffic Control Limitations

(*Continued from page 48*)

of personnel, plus the fact that voice provides the principle medium of ground communication as well as air-ground communication, all result in possible errors and delays in the handling of ground communications for air traffic control.

Insofar as the control of air traffic is concerned, the aforementioned communication facilities are merely a means to an end—the receipt of up-to-the-minute information concerning aircraft operating within a control area and the resultant issuance of control instructions to those aircraft. Between the receipt of the flight information and the issuance of the necessary control instructions are many steps, which take place within the center. These include copying the information, reading it, sorting the data for the various flights, posting the data on the flight progress boards, calculating the estimated times of arrival and arranging the data in proper time sequence. All of these steps are necessary for the compilation of an accurate, complete and concise tabulation of flight data which must be presented before the control personnel for their use in determining and issuing the proper control instructions.

As the rate of flow of air traffic into a given area increases, an increasing number of flight data posting operations must be accomplished in the same period of time. In other words, as traffic increases, not only must a correspondingly greater amount of time and work be expended per flight, but the time available for handling each flight *decreases*.

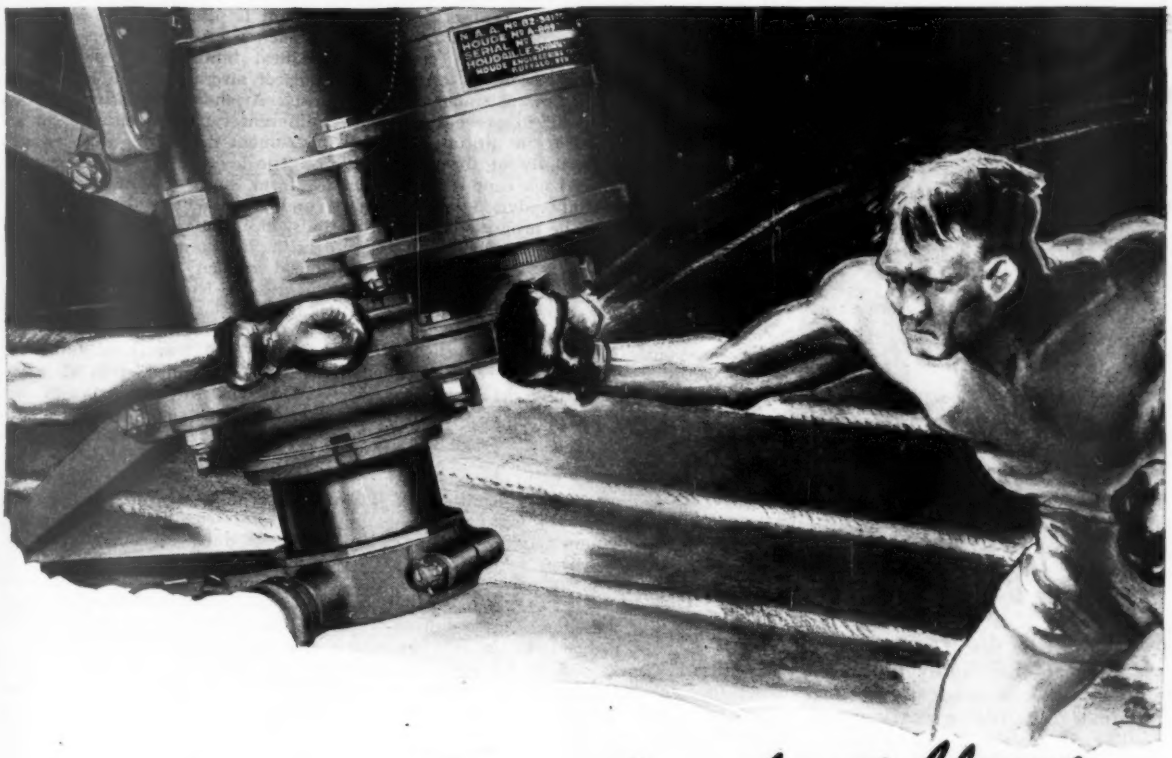
Another limiting factor in the present system for handling flight data within an airway traffic control center is the obscurement of the posted information by the personnel writing the various entries on the flight progress boards. As traffic increases, the personnel posting the data expend a considerably greater proportion of their time writing and sequencing the postings. The increasing work load and time required to handle the flight data plus obscurement of the data for an increasingly greater proportion of the time, plus the crowding of personnel before the flight progress boards with resultant confusion and interference, all combine to produce a situation wherein the tabulations of flight data no longer are available to control personnel in up-to-date and complete form.

Recent studies by the Air Traffic Control Division of the Civil Aeronautics Administration indicate that the limitations in handling flight data within the airway traffic control centers may result in a break-down in control efficiency within several of the control areas by 1945 or 1946.

In addition to the handling of flight data within each airway traffic control center, there is considerable interchange

FLYING

"That makes five planes you have to your credit—all ours!"



Light jabs or knockout blows

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The job of an airplane shimmy damper is to absorb shocks.

Sounds simple — but actually it involves many engineering complications. When shimmying forces go on a rampage, they fluctuate violently, but the damper must keep nose or tail wheels running straight and true . . . and in any extreme of temperature.

A tough problem! But the Houdaille* Hydraulic Shimmy Damper provided a conspicuously successful solution on America's foremost bombers, fighters and cargo planes.

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"It's the little things we look forward to!"

The first Thanksgiving dinner at the family table . . . your plate heaped high with Mom's golden-brown turkey and all the "fixin's" . . . that's one of those "little things" you're looking forward to.

It will be something you'll remember with pleasure for a long while to come . . . like your first pair of W. L. Douglas "Etons", tops in style and comfort.

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of flight data between the centers and between centers and airport traffic control towers. Airway traffic control centers must co-ordinate closely in order to maintain a smooth flow of traffic between control areas and to prevent requiring sudden changes in altitude or other instructions abruptly at the control area boundaries. Each center must, therefore, be kept fully advised by adjoining centers as to the progress of and instructions issued to each flight proceeding into its area.

The interchange of flight data between each center and the control tower in its control area is even greater than that between centers. Each tower must be kept advised concerning aircraft approaching its airport, and the tower, in turn, must keep the center advised of the progress of aircraft approaching and departing.

The interchange of flight data as described above must be transmitted by personnel working at the flight progress boards in both centers and towers, since the information is either taken from or recorded on the flight progress strips. Therefore, in addition to the load on the communication facilities, the required interchange of flight data not only increases the work load of the personnel but further contributes to the eventual loss of efficiency and break-down of the manual flight data posting system.

Under the present air traffic control procedures in the United States, each aircraft operating in accordance with instrument flight rules on the civil airways is provided certain minimum lateral, horizontal and vertical separation from other aircraft. These three types of separation mean, in effect, that each aircraft is protected from collision with other aircraft by virtue of operating in a reserved, constantly-moving portion of the air space which is approximately 30 miles long (based on 10 minutes flying time at an average of 180 m.p.h.) five miles wide (one-half the width of the civil airways) and 1,000 feet high (minimum vertical separation provided pilots when visibility is less than one mile).

The problem of fitting the aircraft in the air space, with their accompanying collision-preventing blocks of moving air, may be compared with packing cubes in a large box. It is relatively simple to put 50 cubes into a box which will hold 100 cubes since they could be dropped in haphazardly without danger of overflowing. However, the problem of putting in 90 cubes would be more complex since the majority of the cubes would have to be arranged in neat rows or layers in order to get them into the box. As the number of cubes approached 100, considerably more time and more work would be required per cube.

The control of air traffic on the airways is decidedly more complex than the fitting of cubes into a box, since, (1) each cube of air space surrounding an aircraft is constantly moving, (2) pilots frequently desire to change altitude (compared with a change of layers after the cubes are packed), (3) aircraft move at varying speeds, which tends toward irregular lengths of air cubes, and (4) a time limit is placed on the consideration of each control problem.

Procedural limitations also apply to the flight of aircraft to and from landing areas. At the present time airports have different capacities during contact and instrument flight rule weather conditions. The average major airport may handle from 40 to 75 movements per hour under contact weather conditions, but falls off to 10 to 12 movements per hour during instrument weather.

Reduced capacity during instrument weather results from the fact that aircraft must be "stacked" over or near the range station at airport of destination at intervals of 1,000 feet in altitude, and landings are accomplished in slow, orderly succession. In most instances each aircraft makes, in sequence, an instrument approach procedure which normally requires from 12 to 15 minutes to complete. Thus, today only one aircraft can land each 12 to 15 minutes, or only four or five aircraft can land per hour at a given airport during weather conditions requiring instrument approaches.

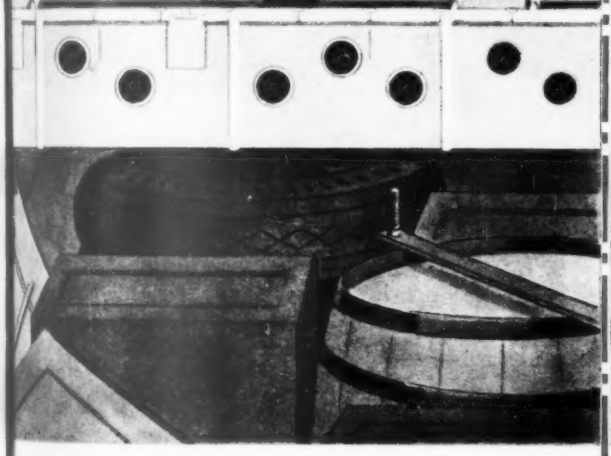
It is inconceivable to think that air transportation will be so limited that only four aircraft will be able to land per hour at a given airport and much thought has been given to methods of safely increasing the rate of traffic flow. To this end, "approach control" has been developed by the Civil Aeronautics Administration and is now in operation at a number of locations. Approach control merely means that local control of aircraft during instrument weather conditions is delegated to an airport traffic control tower in order to eliminate the communications delays encountered as a result of using indirect methods.

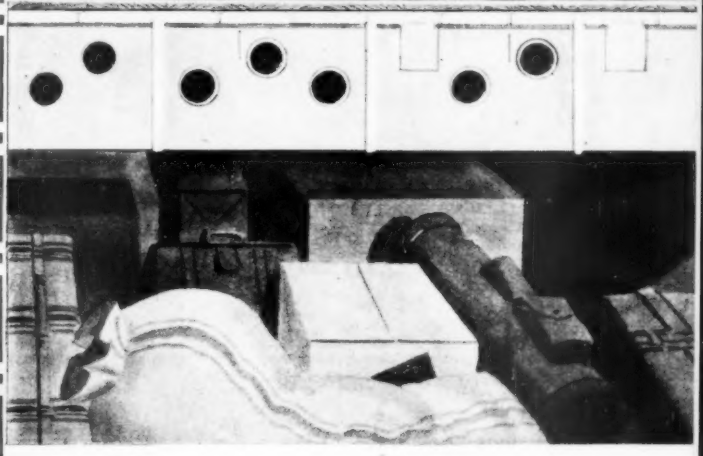
Direct communication between the airport traffic controller in the control tower and the pilot of an aircraft in a landing sequence materially expedites landings. When navigational facilities are arranged so that aircraft can make a "straight in" approach from a holding fix on the approach leg of the range to the airport, the time interval between successive approaching aircraft can be five minutes instead of 12 to 15 minutes required for conventional approaches. This means that local instrument control by control towers (approach control) makes possible approximately 12 landings and 12 take-offs per hour, or a total of 24 aircraft movements per hour.

Ultimately, however, the flow of air traffic to and from an airport during instrument weather conditions must be possible in the same volume and with the same frequency as is possible during contact weather conditions. It is only by reaching this objective that landing areas and airway facilities will be utilized to their fullest capacities at all times and air transportation will reach the degree of regularity and dependability which will be required in the future.

Personnel limitations in the control of air traffic apply both to personnel on the ground and personnel in the air. As traffic increases, the limitations of ground personnel will become more apparent as a result of the limited number of air-

(*Continued on page* 105)





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Evolved from an airline design, the Commando will be available for commercial operation as soon as the strategy of war permits. Its conversion into a luxury airliner or a cargo carrier will be speedy. This will help to bridge the gap between war and peace by providing jobs for the men and women who build and operate these transport airplanes. Look to the Sky, America!

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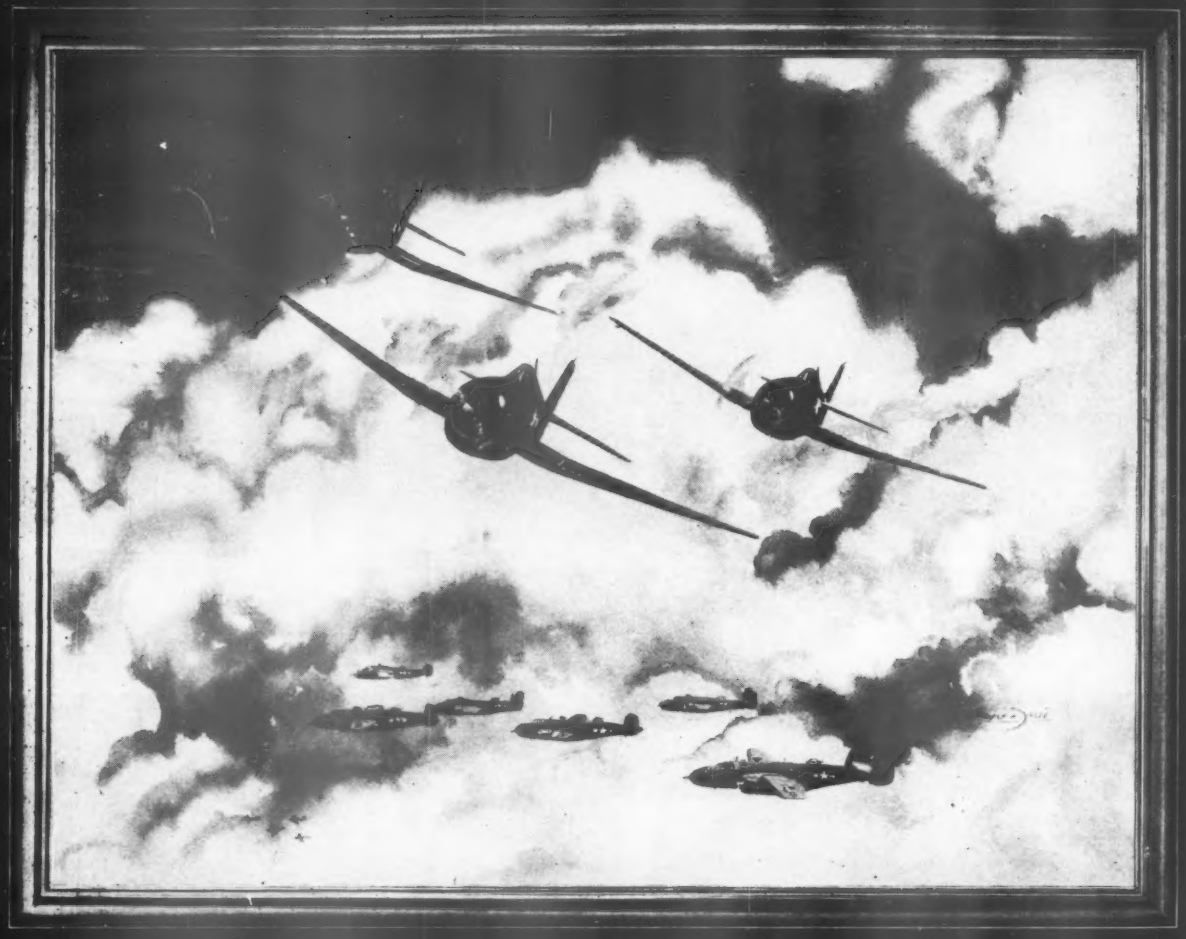

U. S. Navy's Grumman Hellcats—Escorts of the Sky

Grumman

AIRCRAFT ENGINEERING CORPORATION, Bethpage, L. I., N. Y.

craft which can be controlled by a given individual. Flight personnel, like ground personnel, are limited in the amount of work that they can do.

Thus, any simplification in the duties of control personnel and flight personnel which can be accomplished will result in an overall increase in the efficiency of air traffic control. Likewise, the more that actions related to the control of air traffic can be made automatic, the more it will be possible to control increasing numbers of aircraft with a decreasing significance of the human element.

As was pointed out earlier, the standards of efficiency of air traffic control must rise in the future if air transportation is to assume its rightful place in the economy of this country. Therefore, in order to raise the standards of efficiency, the limitations of the present system of air traffic control must be analyzed and necessary improvements planned. The major limitations of the present system of air traffic control in the United States may be summarized as follows:

1. Air-ground communication limitations, involving insufficient numbers of channels, insufficient facilities for the control of all air space and limitations of voice in communication.
2. Ground communication limitations, involving insufficient facilities for the transmission of movement and control messages required by constantly increasing air traffic activity and limitations of voice as a communication medium.
3. Flight data posting limitations, involving increased work loads and time required to handle flight data more than proportionate to traffic increases, increased obscurement of flight data as traffic increases and ultimate capacity beyond which breakdown of efficiency of control occurs.
4. Flight data interchange limitations, involving continually increasing interchange of flight data, as traffic increases, between airway traffic control centers and between centers and airport traffic control towers.
5. Procedural limitations, involving the necessity for reserving a huge cube of air space for each aircraft flying under instrument weather conditions along the airways, and restrictions on airport capacity during instrument weather conditions because of the appreciable time interval required between successively arriving aircraft.
6. Personnel limitations, both on the ground and in the air, involving maximum capacity to do work which, if exceeded, results in break-down of control efficiency.

If air traffic control is to be prevented from becoming the one factor which may limit utilization of air transportation in the post-war era, these limitations must be overcome. END

5 YEARS AGO

FROM the November, 1929, issue of this magazine:

"The Army and Navy are not popular with many members of Congress," Margaret Robertson asserted in an article on "Federal Appropriations" which pleaded for an increase in the meager allotment made for the nation's air forces. Her article was implemented with statistics showing that of the $331,000,000 appropriated for military activities only 22 per cent could be expended for the air corps and less than 17 per cent of the $36,000,000 Navy and Marine Corps allotment. . . . The same issue warned, in the blurb for another article, "The Eagle of the Orient Is Just Learning the Use of Wings . . ."

Private and industrial flying—proving ground for many of the ideas that are winning the war today—were experiencing their first big boom. B. G. Dahlberg reported in "The Magic Carpet of Business" that he had flown some 300,000 miles in his Stinson *Detroiter* between the wildly separated offices and factories of the Dahlberg Sugar Industries. He was in the process of building up one of the first industrial fleets of aircraft. . . . Warren Scholl, an industrial engineer of Chicago, had just completed basic plans for the first transoceanic air route to reach Tokyo across Bering Straits, Northern Canada, and Iceland to London. "Passenger rates," it was reported, "will be $1,800 for the round trip from New York, Chicago, or Winnipeg to London." END

THE "BLACK WIDOW" STRIKES FROM A STEEL WEB!

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BLACK WIDOW
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AIRPLANE PARTS CRAFTSMEN
SINCE 1934
Skylark Manufacturing Co., Inc., Venice, Calif.

Engines for Private Planes

(*Continued from page 25*)

climb, the high speed performance of the engine would be seriously affected, since the engine would operate at approximately 3,200 r.p.m. with poor propeller efficiency. The same situation faces the producers of airplanes using engines of higher output.

Table III, shown below, gives some definite figures pertaining to a three-passenger airplane with extremely good performance, powered by an engine rated at 120 h.p. at 2,600 r.p.m.

The selection of the propeller for this engine was naturally a compromise, with the best all-out performance given by the 57° pitch propeller. The airplane would cruise nicely with three passengers and luggage, at 120 m.p.h., giving approximately 20 miles per gallon of gasoline. However, the take-off performance was poor since, as the table shows, only 92 h.p. was available. Therefore this airplane should be equipped with either a constant-speed propeller or an engine of greater horsepower.

In this same airplane under the same conditions, a direct-drive engine with 298-cubic inch piston displacement developing 155 h.p. at 2,930 r.p.m. has been installed and followed by a 298-cubic inch geared engine developing 160 h.p. at 3,200 r.p.m. The performance with either of the latter engines is much improved. However, the geared engine, from a take-off standpoint, gives much better results than the direct-drive engine, although the top speed is only two m.p.h. better. This is shown in Table IV.

giving a propeller speed of 2,200 r.p.m. A geared engine of 199 cubic inches will develop 110 h.p. at 3,500 r.p.m. of the engine at 2,200 r.p.m. propeller speed. On the other hand, a direct-drive engine developing 110 h.p. at 2,200 r.p.m. of the propeller will require approximately 315 cubic inches, or cylinders of approximately 5-inch bore and 4-inch stroke. The engine would be approximately 60 pounds heavier than the geared engine. At the same time, while perhaps of somewhat more simple construction, it would have the disadvantage of being rough when turning at slower speeds, since it has much heavier reciprocating parts.

The geared four-cylinder engine usually does not require complicated balancers to eliminate serious torsional periods. On the other hand, the geared six-cylinder engine with its more flexible crankshaft, due to the added length, usually requires vibration absorbers to eliminate the torsional periods. These torsional absorbers, or balancers, as they are called, usually are complicated and certainly tend to increase the cost, not only of the engine itself, but also for service.

Certainly the trend of power plants will be toward higher and higher rotational speeds. However, with increased speeds it will be necessary to change the ratio of the reduction gear unit so that the propeller will be turning in the neighborhood of 1,800 to 2,200 r.p.m., to maintain satisfactory efficiency.

It is hoped that some of the manufacturers of automobile transmissions will

TABLE III

Prop. diam. (inches)	Prop. pitch (degrees)	Climb r.p.m.	Horsepower during climb	Full throttle level flight r.p.m.	Full throttle level flight horsepower	Full throttle level flight speed (m.p.h.)
74	53	2,150	95	2,820	130	145
74	57	2,100	92	2,780	125	150
74	60	1,900	87	2,680	123	154

TABLE IV

6AC-298 Direct-Drive Engine
Rated at 155 h.p. at 2,930 r.p.m.

Climb r.p.m.	Horsepower during climb	Full throttle level flight r.p.m.	Full throttle level flight horsepower	Full throttle level flight speed (m.p.h.)
2350	130	2,950	156	160

6ACG-298 Geared Engine
Rated at 160 h.p. at 3,200 r.p.m.

Climb r.p.m.	Horsepower during climb	Full throttle level flight r.p.m.	Full throttle level flight horsepower	Full throttle level flight speed (m.p.h.)
3200	160	3,800	185	162

In flying behind both engines, the passenger's reaction from the noise standpoint was much better with the direct drive engine. The geared engine gives the same impression as experienced in driving an automobile at high speed in second gear. Therefore it will pay the airplane manufacturer to insulate the passengers from engine noise.

The geared engine, from a weight and efficiency standpoint, certainly has many advantages. Consider a 110 h.p. engine develop or standardize on an aircraft reduction gear unit which would be applicable to several makes of engines. These companies furnish the same transmissions for several different automobile companies, thus resulting in a very low cost per unit. The same thing could be applied to gear reduction units for the aircraft industry. There is no reason why aircraft engine manufacturers could not get together and work out a plan of standardization, provided they would agree to install a standardized gear reduction unit. Heretofore each aircraft manufacturer has insisted on a particular engine design to fit his needs. Certainly if engine prices are to be reduced materially the airplane manufacturer must do his part in standardizing, not only the gear reduction unit but mounting pads, manifolding, accessories and other parts.

The points brought out in the above discussion, as far as the four and six-cylinder engines are concerned, apply also to the eight and 12-cylinder engines if greater power is needed. The horizontally opposed eight-cylinder engine certainly has definite advantages for the personal plane, where a power range of 200 to 300 h.p. is required. These engines can be built successfully as a direct-drive, as well as a geared power plant. However, when used with a gear reduction unit it is necessary to use more or less complicated vibration absorbers to eliminate the serious torsional periods.

The 12-cylinder opposed engine need not require the addition of dynamic balancers, since experience has shown that if a seven-bearing crankshaft is used, it is apparently more rigid torsionally and, therefore, does not introduce serious vibration problems.

The advantage in utilizing more cylinders for the increased power to meet the requirements of airplane manufacturers lies in the use of many interchangeable parts—cylinder assemblies, connecting rods, bearings accessory housing, gear reduction units—all common to the six, eight and 12-cylinder power plants or a power range of 150 to 500 h.p. This again means a compromise, especially in weight, for the engines in the lower horsepower bracket. Nevertheless, to reduce engine prices there must be a continual compromise of the ideal.

To meet the expected demands for widespread air travel, the popular post-war lightplane engine should be designed to permit satisfactory operation on any of the fuels which may be found in gasoline stations serving automobiles. Just what the octane rating of post-war auto fuels will be, no one seems to know. However, there are definite indications that standard auto fuel will be at least 78 octane, which is approximately five points higher than the gasolines commonly used in 1941, and premium fuels will be at least 82 octane. It is hoped that the lead content of the fuel will be kept to the minimum, because of the higher cost of the valves and valve seats necessary to operate satisfactorily with high lead. From the increased octane rating of fuels permitting higher compression ratios it is safe to assume that the post-war engine will produce approximately five per cent more power than engines did with fuels available in 1941.

In the future the aircraft engine manufacturer must work much more closely with the airplane designer for improved performance and in order to eliminate basic service problems. In the past, in many instances, the engines have not been properly engineered into the airplane, with the result that serious service problems have developed which have

(*Continued on page 110*)

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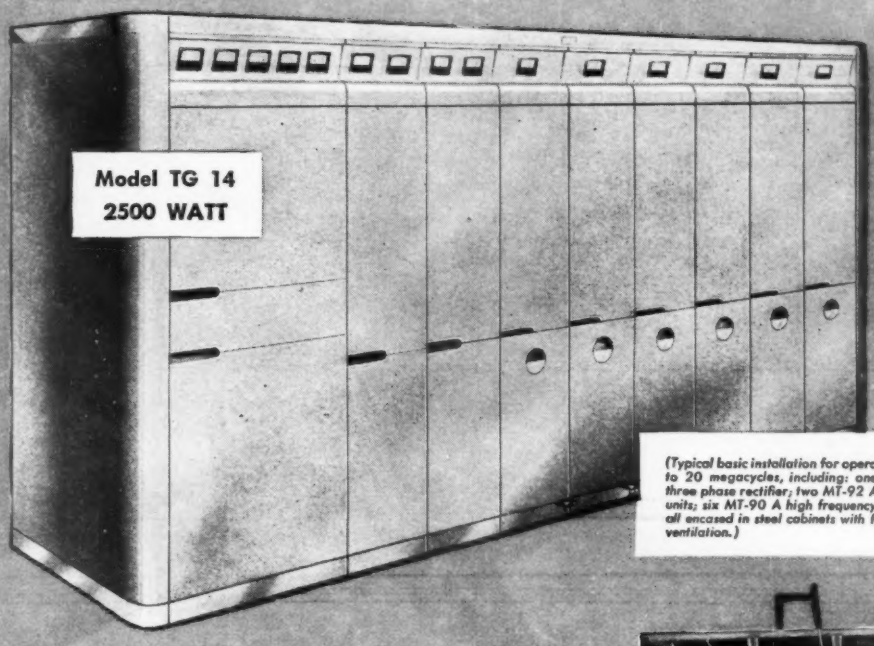

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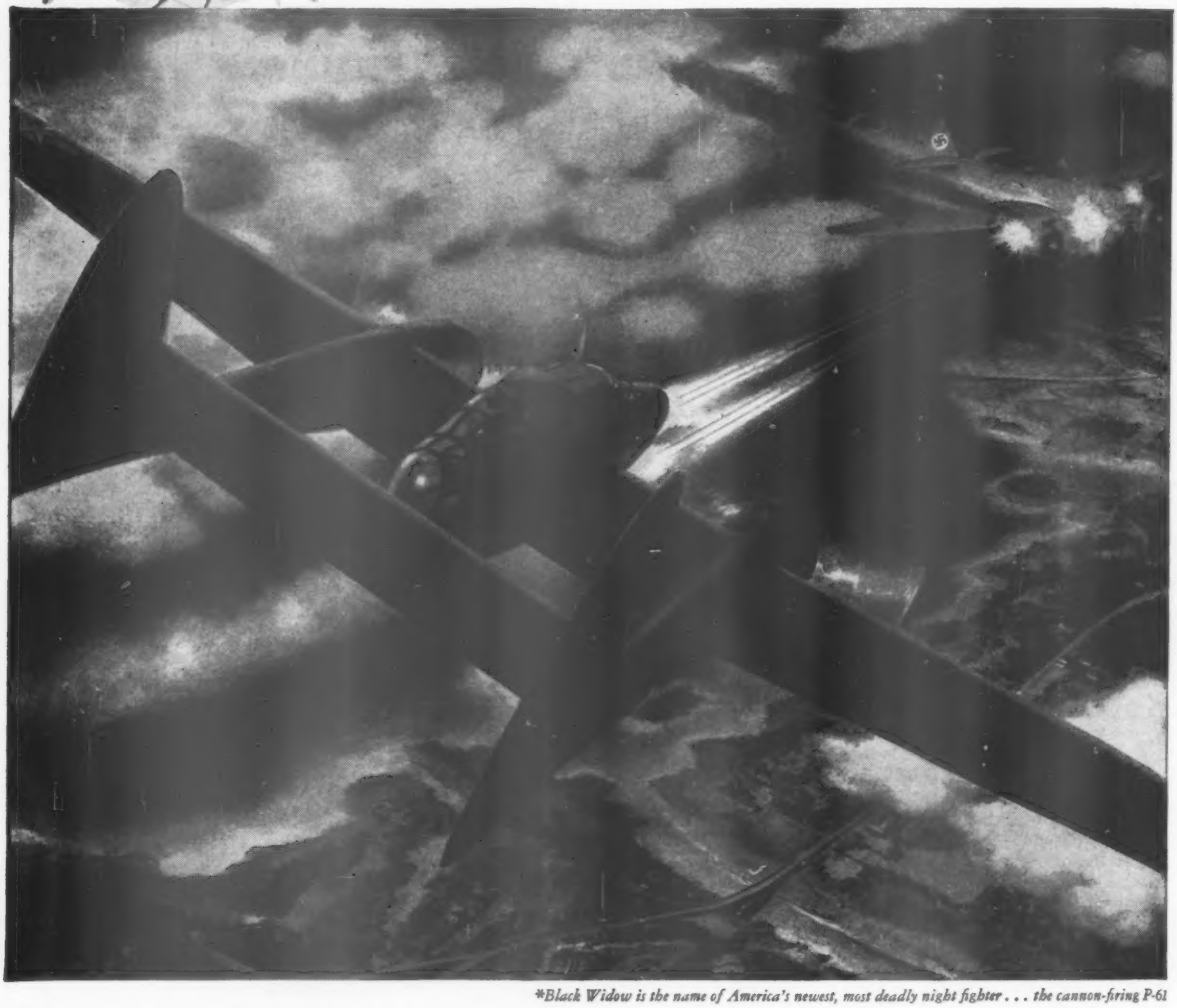
The Black Widow*

SNARES AN AXIS "FLY"!



*Black Widow is the name of America's newest, most deadly night fighter . . . the cannon-firing P-61

An Axis raider drones toward its target, unaware that far ahead . . . the Black Widow is waiting! Busy Axis hands prepare to release their cargo of destruction. Straining Axis eyes peer out into the night . . . where the Black Widow is waiting! But they see nothing, no sign of danger, until suddenly . . . a huge, dark shape appears from nowhere! There's a burst of cannon fire, a blinding explosion, an Axis plane flaming downward . . . the Black Widow has struck!

The P-61 Black Widow is the first American plane to be designed, from the very beginning, as a night fighter. It has *everything* . . . speed to catch an enemy unawares, electronic devices to search in the dark, Fire-Power enough to pulverize anything that flies!

Fire-Power is our specialty at Oldsmobile. Automatic aircraft cannon, such as we have built by the tens of thousands, help give the Black Widow its "poisonous sting." Other Oldsmobile war products include cannon for tanks and tank destroyers, high-explosive and armor-piercing shell, parts for aircraft engines and military vehicles . . . plus other "censored" weapons which are already doing much to "Keep 'Em Firing!"

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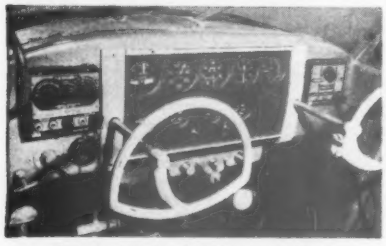

Typical installation of RANGER model 108-B receiver and model 206 10.5 watt transmitter Receiver has 3105 kc spot besides 195-410 kc band, plugs for two sets of headphones and an inter-phone circuit Transmitter operates from 6 or 12 volt ship s battery through RANGER designed vibrator power supply

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(*Continued from page* 106)

been very embarrassing, particularly to the owner. Certainly the owner should expect the same freedom from trouble in his airplane as he obtains from his automobile. The automobile as sold in 1941 was more or less an evolution, with continual refinements from year to year. Any change was tested in the laboratory as well as on the road, under extreme conditions. The personal airplane, on the other hand, has never been service-tested to any great extent before being offered to the public. If an automobile manufacturer thinks it necessary to send a fleet of test cars to all sections of the country to thoroughly prove out changes in design, then aircraft manufacturers must follow the same procedure. In this way problems in the engine and in the airplane will be found and corrected before the plane reaches the owner.

One of the principal problems encountered in the past has been inadequate cooling of the engine under extreme conditions of flight. In many instances the engine manufacturer has been at fault in that there was not adequate cooling surface on the cylinders. In some cases the compression ratio selected was too high for the fuels available. In other instances the aircraft manufacturer was responsible in that he simply would not take the time to properly work out the cooling baffles.

To eliminate this condition it may be necessary for the engine maker to furnish the engine complete with cooling ducts and baffles so that the aircraft manufacturer need only connect the nose piece to the ducts.

Another solution to the cooling problem perhaps would be the installation of the cooling fan, which would be an integral part of the engine. Such a fan, no doubt, would result in a saving in the power required to cool the engine, since some of the modern axial flow type of fans will cool an engine with as little power consumption as two and one-half per cent of the total. This would make it possible to clean up the nose of the plane and perhaps improve the top speed performance.

Another possibility is the use of exhaust ejection type of cooling. Experimental installations are now being tested, with very promising results.

The helicopter engine presents a special problem because the rotor is above the plane, and the engine must be mounted vertically. This requires certain modifications in the engine which are not serious: First, it is necessary to change the lubrication system so that in the wet sump type, the oil would drain from the interior of the engine down into the oil tank. It is also necessary to modify the carburetor intake system to permit the float type of carburetor to operate properly when the engine is in a vertical position. This change is not necessary if a pressure type carburetor or a fuel injection system is used.

To cool a vertical type of engine in a helicopter, it is accepted practice to mount a fan of the axial flow type directly on the crankshaft. From this fan, air is directed to either side of the cylinders or, in some cases, to both sides, depending on the particular type of engine.

The cooling system is not assisted by the movement of the helicopter through the air. Therefore it is essential for the cooling system to supply sufficient air to take care of full throttle operation of the engine, without overheating, while the helicopter is in a hovering state. To cool the engine properly, three to three and one-half per cent of the output of the engine is usually required.

For helicopter use the opposed type of engine has certain advantages since it is much shorter than the in-line type of engine with an equal number of cylinders. It thus permits greater space for the other units which must be housed within the helicopter structure. Thus far, the opposed type of engine when installed in a helicopter, has not required the use of dynamic balancers to eliminate torsional periods. It is quite likely that if an in-line six or eight-cylinder engine were used, it would be necessary to provide torsional balancers, since the crankshafts are so much longer and, therefore, more flexible than the opposed type engine.

One problem facing all types of engines used in helicopters is the necessity of being built to minimum weight specifications. This means that there is practically no flywheel; in fact a flywheel of approximately 10 pounds is the maximum which has been used. Then to obtain satisfactory idling, it is necessary to hold a speed of not lower than 1,000 r.p.m., since, when the engine idles, the rotor system, of course, is not engaged.

The personal plane industry in our post-war era can only succeed in a manner comparable to the automobile industry through standardization, constant technical advance and broader markets. The buying public must be willing to accept more or less a standard design rather than expect specialized airplanes to meet their individual whims. The automobile industry really never began to succeed until the individual manufacturers standardized on a few basic models. The same basic fundamentals on which the automobile industry was founded must be followed in the lightplane field. END

Aviation Answers

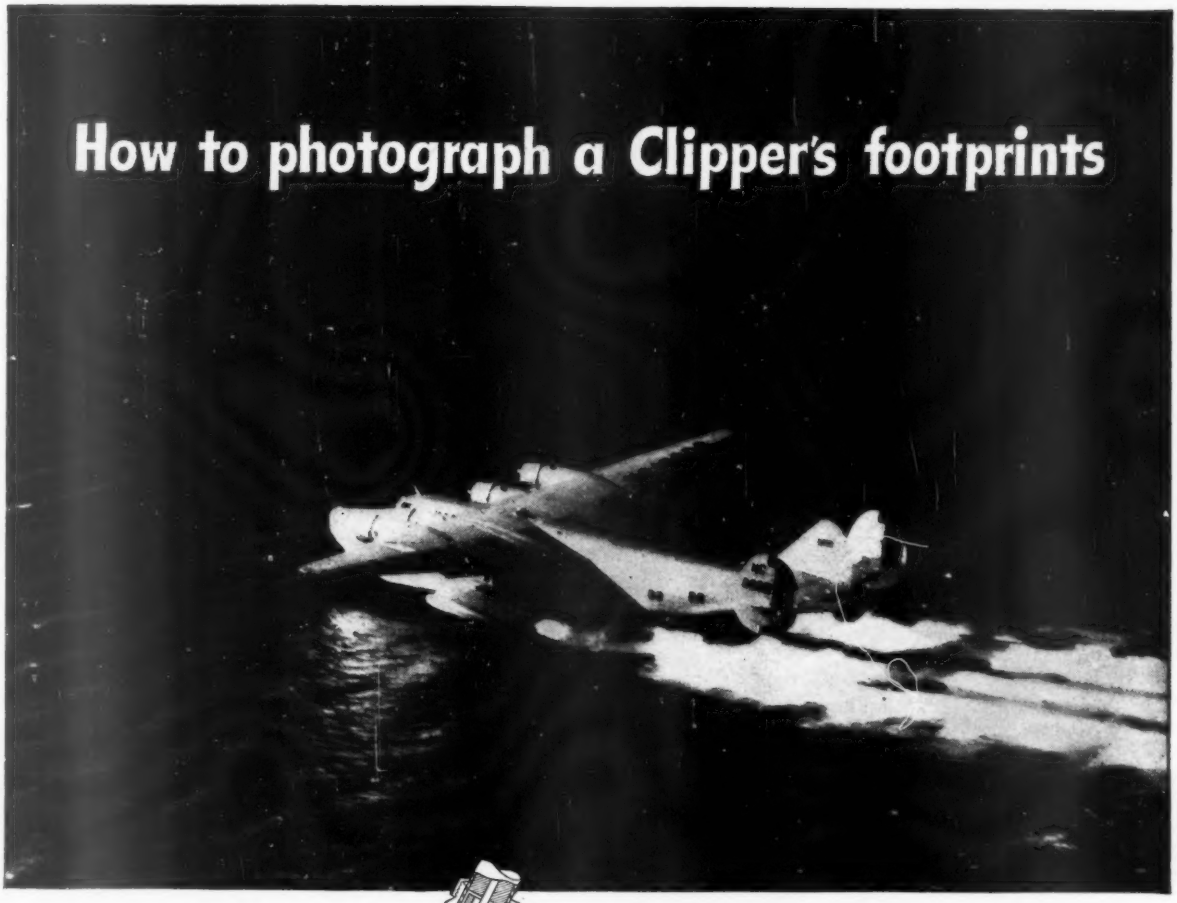
COMPLETE answers to a wide variety of aviation problems are now available to pilots, airport and school operators, and to all others interested in flying through a technical information service recently established by the Civil Aeronautics Administration.

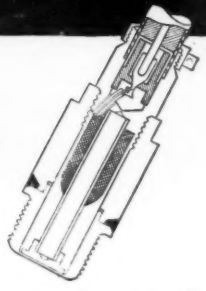
The service was organized by the Aircraft Section of CAA's General Inspection Division. It will consist of a complete library of necessary information on aircraft, engines and instruments. Bulletins will be available covering maintenance, repair and servicing of products.

A standard filing system which makes all of the bulletins easily accessible has been installed in each of CAA's 79 district offices. Attending CAA inspectors will have a working knowledge of the contents of the bulletins.

Aircraft, engine, and instrument companies have co-operated in the plan.

How to photograph a Clipper's footprints

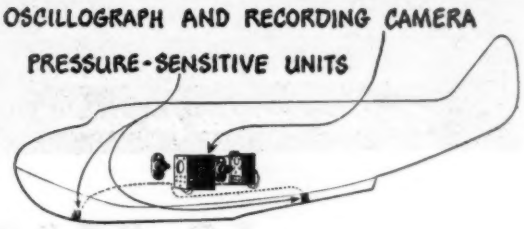




1. This is a "pressure-sensitive unit," a Standard of California development in petrolectronics (use of electronics in petroleum research). When Pan American World Airways wanted to study the effect of the pounding of take-offs and landings on the hulls of their Clippers they asked if this device could be used.

PART OF PHOTOGRAPHIC RECORD OF HULL PRESSURES

3. Here are the footprints of a Clipper during take-off, time of greatest strain on flying boat hulls. The oscillograph record shows little water pressure on the forward hull area. But the jagged upper track reveals that greater pressures battered the hull farther aft.



2. We thought so. It was an unusual job for petroleum engineers, but Standard's research staff—the California Research Corporation—is often consulted by airlines. For this job, two pressure-sensitive units were attached along the keel line of a Clipper hull. These were connected to an oscillograph and a recording camera.

4. These tests that reassured Pan American as to the strength of their Clipper hulls emphasize again that Standard leadership in aviation research rests upon fundamental knowledge of all phases of aircraft operation. This thorough understanding of aviation's needs enables us to produce even better Standard Aviation Gasolines and Lubricants for Pan American, and flyers everywhere.

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You'll be up in the air after the war—flying your own plane when the plans of tens of thousands of sportsmen, business men and aviation enthusiasts for private flying become a reality. Hallicrafters radio telephones for use in your own plane will fit right into those plans. They'll give you greater safety and freedom in the skies. To keep pace with fast breaking developments in aviation, Hallicrafters will be ready with the finest, most dependable two-way radio telephone communications equipment you can get.

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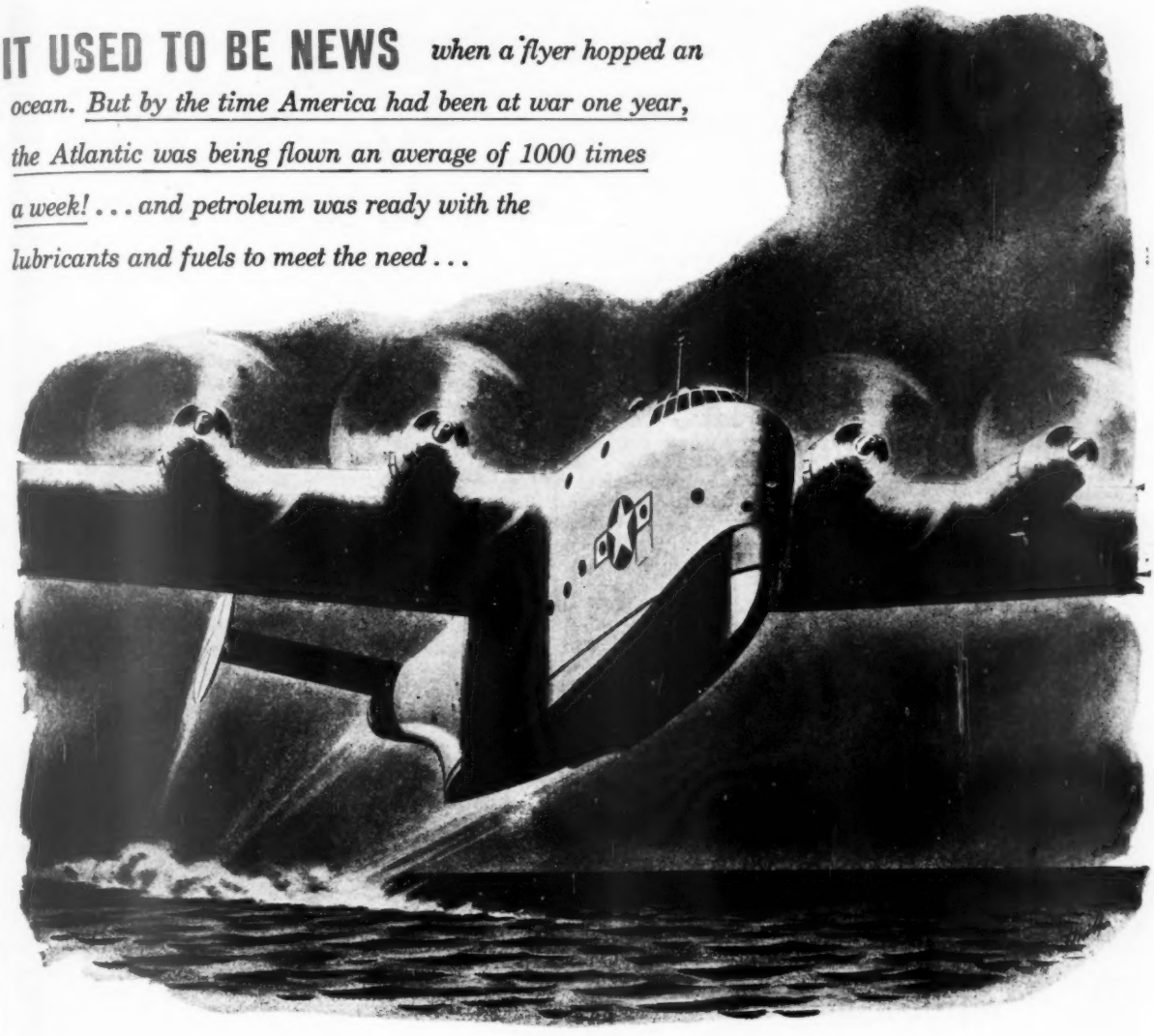
IT USED TO BE NEWS *when a flyer hopped an ocean. But by the time America had been at war one year, the Atlantic was being flown an average of 1000 times a week! . . . and petroleum was ready with the lubricants and fuels to meet the need . . .*



AT KITTY HAWK, in 1903, one of our refineries supplied the gasoline for the Wright brothers' first flight. By 1937, 87 of the 91 successful trans-Atlantic flights had used our gasoline, and no flight supplied by us had failed. So far in this war, we have produced the 100 octane gasoline to power one out of every four British and U. S. warplanes. It is this matchless background of experience —teamed with the largest research laboratory in the industry—that puts "teeth" in our promise that "You can *depend* on Esso aviation products!"

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These beautiful Kaywoodie Briars have, in unusual measure, the quality of staying cool, and of smoking well, drawing out the flavor of tobacco, because they are made with the deliberation and care a man would use in building his home. Carved from a burl (see picture below) that forms at the bottom of the stout, tough briar bush in regions around the Mediterranean Sea. Seasoned for years, and cured by tempering agents without any substance that might spoil the flavor of your smoke—Kaywoodie Flavor is the same as before the war.—If you've been unable to find Kaywoodies lately, it's because of great demand by the Armed Forces. We're sure you'll agree that we must serve our fighters, first! Kaywoodie Company, New York and London. *630 Fifth Avenue, New York 20, N. Y.*

War Bonds come first

Seamen in Spits

(*Continued from page 54*)

themselves with craft nearly three times as fast as their old seaplanes. In addition, they had to learn the essentials of fighter combat tactics and practice, locating targets from land maps and spotting them for artillery fire. They also had to assimilate the British fire control system.

The American spotting system to which they had been accustomed calls for pilots to adjust the shooting by directing changes in the line of fire and range—calling left or right, up or down, so many hundred yards until the batteries are on the target. The British, on the other hand, employ a system which they call "clocking." The pilot lays an imaginative clock over the target area. Due north is 12 o'clock; south, six o'clock; east, three o'clock; the target is the exact center of the "clock's" face. The pilot simply calls the shots as they fall. If a shell lands 600 yards west of the target, he reports "nine o'clock, 600."

But it was not the pilots alone who faced a new and difficult assignment. *Spitfires* assigned to the new squadron were in need of overhaul when they arrived, but they had to be kept flying too. This difficult job fell to enlisted flight maintenance crews from the American warships—skilled mechanics who knew their *Kingfishers* and SOC's by heart, but who had never worked on a *Spitfire*.

Two British maintenance experts were loaned to the group to instruct the American crews. Under direction of Crew Chief V. G. Dirsa of the *Augusta*, repair schedules were set up. All hands voluntarily worked double watches and gave up all liberty.

The training course laid out for the squadron was completed May 28. That was all the time allowed. As a "graduation exercise," General Quesada sent the pilots on a fighter sweep over France. They gave an excellent account of themselves and were immediately moved into this Royal Navy air base. Co-operation between the British and American flyers was excellent from the very start.

Their new commanding officer, Lieut. Comdr. William Denton, Jr., USN, had never flown a *Spitfire* or any other modern fighter. But he determined to be no exception to the Navy tradition which holds that squadron commanders should be fighting leaders. Although his superiors expected him to serve only as administrative head of the squadron, he boned up on British spotting procedure and "checked out" in a *Spitfire* to learn the ropes. He had flown the *Spit* only three hours when H-Hour arrived, but he went out on a spotting mission over France on D-Day, and he and his squadron have been at it ever since.

All of the flyers—British and American—formed pools and were sent out in turn, each making two to three missions a day. Two pilots formed a team. One—called the spotter—did the actual spotting and carried on communications with the ships. The other—known as the wingman or "weaver"—watched for flak and enemy fighters.

During those first few days of invasion the enemy gave a good account of himself whenever the spotters did find a spot he wanted to defend. Flak was heavy all along the front—"so heavy you could put your wheels down and land on it," says Lieutenant Commander Denton. But it was just those spots that the British and American airmen were looking for. Often the pilots came home with holes in their planes—some didn't come home at all.

One of the VCS-7 pilots who failed to return flew his third and last mission on D-Day as wingman for Lieut. (jg) Charles S. Zinn, who was spotting for the team.

"The ship gave us a target—some troops, tanks and trucks concentrated on a road leading into Trevieres," says Zinn. "We made one pass down to about 2,000 feet and found them. When I reported, our ship wanted to know for certain if they were enemy. On my second pass I still couldn't make them out as they were mostly hidden among the trees. The ship told me to make a still lower pass.

"As we came over the target the sky was suddenly black with flak. My plane went out of control temporarily. I found I couldn't turn right or left because the controls were damaged. I called my wingman to tell him I was hit and would have to bail out. He cut in and said something, but it was only part of a sentence.

"I found the plane would still fly and since I was headed for home I managed to pull through for a crash landing on an emergency field. It wasn't until I reached our operations room and saw my wingman's name freshly scrubbed from the availability list that I knew what had happened."

Multiply that sort of thing by 20 men and you have a real picture of how VCS-7 helped to crack Hitler's Atlantic wall. Although their original role was to direct Naval gunfire during the pre-invasion bombardment and until the shore fire-control parties got on the beaches with the troops, VCS-7 spotting was so successful that they were continued with the British as the "eyes" of the bombarding fleet during the drive to and the final blasting of Cherbourg.

"Their flying and spotting has been remarkable," said Wing Commander Hardiman. "Normally a pilot spends a year in *Spits* before he goes into combat operations. Only chaps of high intelligence could have absorbed their training so fast. What Denton did—changing over from float planes to *Spits* in combat with only an hour or so of preparation—is quite remarkable. I wouldn't have wanted to do it."

And the pilots themselves? They are hoping to get permanently assigned to fast flying fighter-observation planes. Their old *Kingfishers* and SOC's were necessarily slow and clumsy for catapult launchings, open sea landing and recoveries, and long-range scouting missions at sea. What they really want is to do some spotting from carrier-based *Hellcats* or *Corsairs* when the Allied forces land in Japan. END

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You Still Have TIME

to enter this Popular POST-WAR "AIRCRAFT QUIZ"

THOUSANDS have already filled in and returned their answers to the Bellanca Aircraft Quiz. Perhaps there's no easier, more convenient way to register your views on post-war personal aircraft.

This is all you do. Send for the printed Aircraft Quiz, and check your answers. Later we'll mail you a digest of the score, so you can compare your preferences with those of many others who are intensely interested in peacetime flying.

You'll find the many provocative questions appearing in this Quiz worth *thinking* about! Let's take four or five questions at random, so you'll see what we mean. For example, how many engines do you want? Some say one, others prefer two! Another question is: What cruising and top speeds? Here you'll find a list of speeds beginning at 115 cruising with 130 top speed and ranging to 200 cruising with 250 top. Simply check-mark the speed *your* post-war plane should have—and if our table doesn't go high enough, just write in your speed!

Again there's the question on wing characteristics. Do you want a fixed, folding or detachable wing? And a related question—which wing style is your favorite: low-wing? mid-wing? high-wing? biplane? You'd be surprised how the vote is running on these basic features.

One of the most-discussed subjects on our popular Aircraft Quiz is the landing gear question. Here are the check-off items: Fixed streamlined? retractable? tricycle streamlined? tricycle retractable? Which do *you* prefer? Why not give some thought, now, to this and the many other points of post-war aircraft

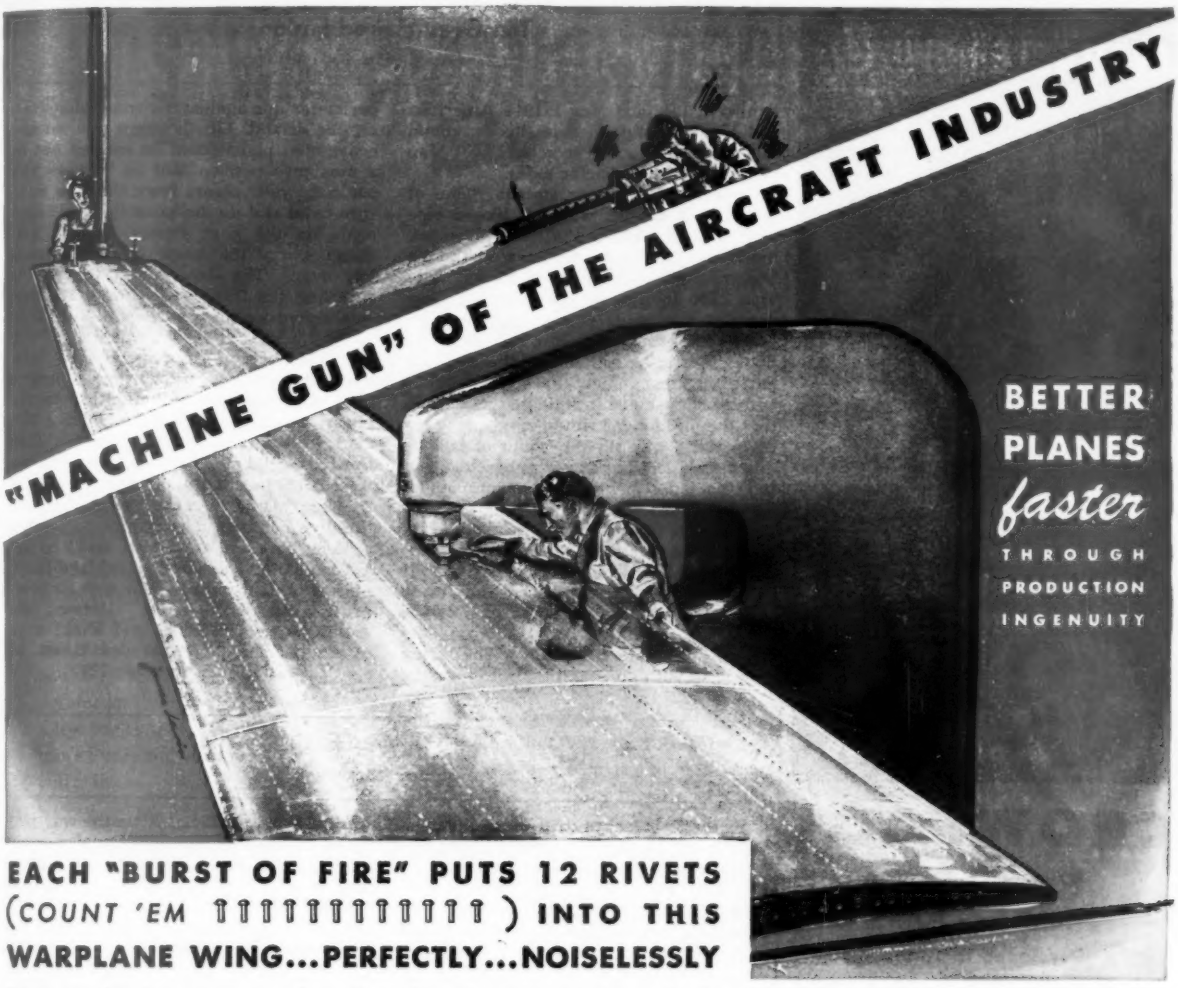
design and operation covered by this amazing Quiz? It takes no time to fill out and check your answers—and it helps you develop more definite ideas that may serve you well when the happy day comes to buy and fly your own plane!

We've been offering the Bellanca Aircraft Quiz in the magazines for several months, while proceeding with our war work, building armaments and components for victorious United Nations warcraft. Men and women have written for the Quiz from Brazil, Chile, Mexico and Canada — from New Guinea, Australia, England and almost every place where Americans carry the flag of freedom — plus thousands within the nation. Yes—there's still time to enter your name in this Quiz. Just write us—you'll get the Quiz, free of obligation, by return mail. Bellanca Aircraft Corporation, Dpt. S-1, New Castle, Delaware.

Keep on Buying U. S. WAR BONDS

BELLANCA

RYAN PRODUCTION ENGINEERING DEVELOPMENT NO. 205



EACH "BURST OF FIRE" PUTS 12 RIVETS (COUNT 'EM ↑↑↑↑↑↑↑↑↑↑↑↑) INTO THIS WARPLANE WING...PERFECTLY...NOISELESSLY

Plane production goes at a fast clip when rivets are put in perfectly 12 at a time. That kind of speedy riveting, replacing setting individual rivets by noisy pneumatic rivet guns is production with a capital "P". It speeds warplane production and means lower costs to the taxpayer.

Ryan was foremost in the application of multiple hydraulic riveting to aircraft work. These new methods aren't just "something that happened". Their development at Ryan is the result of far-sighted planning of methods to combat the shortage of labor, and get more airplanes into the air at our fighting fronts.

This wholesale riveting technique is new and unique in the industry. Cooperation is being extended to other airplane manufacturers in giving them full technical information on the advanced "gang riveting" methods developed by Ryan—methods which are symbolic of this pioneer company's leadership in aircraft design and engineering for production . . . in wartime and in peacetime.

THE PROBLEM: The outer wing panel skin of the potent warplane shown in the illustration contains about 5,000 rivets. Ordinarily it would take eight workers (four good riveting teams of two people each) two-and-a-half hours to complete this job using noisy pneumatic rivet guns and setting one rivet at a time. *How* to cut these work hours?

THE SOLUTION: Ryan production experts introduced multiple hydraulic riveters larger and deeper throated than ever attempted to be used before. Using a specially designed overhead conveyor system, the entire riveting job is now completed in an hour-and-a-quarter by three workers, (one operator and two unskilled helpers.) Because a *machine* sets the twelve rivets at a single stroke of the ram, absolute uniformity and perfection of workmanship is gained.

THE ADVANTAGES: On assemblies adaptable to Ryan's "super-gang riveting" technique great savings in man power are possible. Rivet gun marks, skin waviness and swelled rivets between skin layers are eliminated. And, no special training of the operator is necessary; women can be used as readily as men. Figuring up the man-hours saved by the perfection of this single production idea, as applied to the eight multiple hydraulic riveters in operation in the Ryan plant, the amount totals some-1500 man hours per month . . . . the equivalent of the work of about 75 people.

RELY ON RYAN TO BUILD WELL

1922-1944

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Fine Service Tools for All Industries

The Gray-Haired Ensign

(*Continued from page 49*)

tember 1, 1942 and May 1, 1944, American and New Zealanders under his command shot down in aerial combat 3,031 Jap planes out of the Pacific skies.

An Australian paper stated: "One of these days Rabaul will fall like a ripe plum." It is Admiral Fitch who shook the tree. The Fitch airplanes, fit though few, multiplied themselves to fly more than 2,700 daylight assaults upon it. They dumped thousands of tons of bombs on targets in this strongest of Japanese South Pacific bases, cleaned the shipping out of its magnificent harbors, wrecked its airfields, and so intimidated its airmen that they no longer would rise.

On their way up the chain of islands our planes left hundreds of beached and burning ships behind and thousands of Japs stranded in steaming jungles. Admiral Fitch worked it out this way: first he knocked out the enemy's air, pulverized his airfields, blew up his antiaircraft guns with the dive bombers. Then came the resistless Marine raiders to take the strip of land, and with them came the Seabees to build the fields. The Army moved in with guns and tanks to hold the perimeter line against the remaining Japs on the island. If they got too rough, evacuation plans could be carried out in a moment's notice. But as long as you could fly your planes from the new vantage point and do the same thing all over again on the next strategic island you didn't worry too much about the Japs left over. The Japs found themselves guarding the front gate with the Yanks established in the parlor.

Next began a war of attrition. With the flyers carrying out methodical daily strikes against the next island objective they paid just enough attention to the enemy on their own island to drive him mad with intermittent bombing. When the Japs could stand it no longer, they got their boats together and made a break for freedom. Only then did the fighters and the dive bombers take proper cognizance of them, fore, aft, amidships, and keel up!

Throughout this many-sided land-based air warfare, Admiral Fitch was an ever-present, inspiring figure. Dressed like the rest in rough shoes and khaki work pants, his shirt open at the throat, he

(*Continued on page 122*)

Make Flying Easier

(*Continued from page 31*)

expected to object to it. Unless our manufacturers develop a simpler method of steering aircraft, this vast potential market will remain largely unsold, even though the cost of the airplane is reduced, because as long as piloting remains physically intricate it will remain financially expensive.

Some people still spend $5 to learn to drive an automobile properly. Private pilots, to fly with a minimum degree of safety, need at least 50 hours' flying time, which requires an immediate *minimum* expenditure of $375. At the present minimum cost of flight instruction, and utilizing the smallest two-place training plane available, this 50 hours' flight time could be broken into 15 hours of instruction at $9 per hour and 35 hours of solo flying at $7 per hour. Even then the new pilot is scarcely experienced enough to be classified as a novice.

The cost of learning to fly, with the present complicated method of control, is hindering the development of private flying, which in turn prevents the normal expected growth of the private aircraft sales market. There is a definite need now, which will increase many thousandfold after the war, for a private airplane that any automobile driver will be able to operate after three or four hours' flight instruction and thereafter be able to fly sufficiently well to take the family up in safety. To attain this objective, the first constructive solution would be to eliminate the unconventional method of steering aircraft with the feet.

Possible objections to eliminating foot steering must not be overlooked. There were 83,771 private pilots licensed in the United States in 1941. After the war, perhaps a half million additional persons may have obtained sufficient flight training, mainly through military sources, to qualify for a pilot's license. All these pilots, both pre-war and war-trained, will have been instructed on aircraft steered by foot control. They may conceivably object to any change in that method.

In the past, objection to elimination of foot steering has been voiced by pilots who are opposed to any change in the "technique" of piloting. This is partly due to the fear that personal piloting skill acquired at considerable time and expense might suddenly become relatively valueless.

Several American private airplanes featuring total elimination of steering by foot control had attained some production prior to the war, notably the *Ercoupe* and the *Skyfarer*. The *Ercoupe* has twin rudders connected by linkage with the hand wheel control, which synchronizes the movement of the rudder and ailerons in one movement. The *Skyfarer* has twin fixed fins resembling rudders which provide directional stability, while steering is accomplished by aileron control only and actuated by a hand wheel as in steering an automobile. Both methods eliminate the "third control," or rudder pedals.

The simplicity of operating two-control airplanes, mechanically paralleling the Civil Aeronautics Board's proposed simplification of Civil Air Regulations governing private flying, is doing much to eliminate the public's unfortunate "superman" complex regarding private flying.

The *Ercoupe* and *Skyfarer* airplanes

(*Continued on page 134*)

POST WAR AVIATION OPPORTUNITIES Bulletin

VOLUME 1 NUMBER 1

Introducing a New Service For Air Force Personnel

So you'd like to stay in aviation after the war but "pilots will be a dime a dozen and there won't be much use for bombardiers and gunners anyway"...

If that's what you've been thinking, when you get time to think, about your chances for hooking up with the aviation field *after* you finish fighting the war, then these Postwar Aviation Opportunities Bulletins may be able to toss a few angles at you. Angles about aviation's future and where your experience will fit in.

NO PIPE DREAMS

These bulletins won't be pipe dreams about gravity-repelling, triple-expansion jet turbine jobs with Betty Grable bodies and Coca-Cola running out the manifold hoses. We're not in the crystal-gazing business and our numerologist was drafted a long time ago.

NEW OPPORTUNITIES

But there *are* many new uses for commercial and private aviation which are developing right now while the war's going on. Anyone in the Air Forces knows that there's a lot more to flying than the pilot and the plane. The organization required to utilize them is the biggest part of the job. Airline companies and aerial "taxis" are only a part of the postwar aviation potential.

INQUIRIES WELCOMED

...It will be, then, the task of these bulletins to investigate as many branches of business as have already set up shop in aviation, or are merely waiting for the green light of peace to go into it, and to pass this information on to you pilots, navigators, gunners, ground crew men, etc., with suggestions as to how you may be able to combine prewar experience or study with your wartime aviation training for a postwar job.

Union Oil Company's Aviation Department welcomes inquiries and will be glad to furnish information or help interested personnel contact those parties or firms about whom inquiry is made.

These bulletins will be published as a series in the various popular magazines. Watch for them. Whether you're in the Army or Navy, in a plane or on the ground, we think they'll give you something new to think about where postwar aviation is concerned...

Aviation Cashes In on Fishing

No, we don't mean flying fish... We mean sardines, tuna, pilchards, herring and other food fish that are the annual targets for the multimillion dollar fishing industry.

Locating schools of these fish by aircraft is a postwar field that is likely to present profitable job opportunities for many. The idea of aerial scouting for fish is not a new one. Private planes have been used by individual companies for some years in California and Oregon, and in 1941 a Seaplane Fisheries Service, Inc., was formed in Bay City, Oregon, for the purpose of aerial searching. Outbreak of the war put an end to this enterprise but it was so promising that various firms succeeded in securing permission to have coastwise patrolling Navy and Coast Guard planes and blimps report fishery concentrations. These branches of the service have collaborated, with a marked increase in catches as a result. Similar aerial fishery scouting has also been carried on by at least one Australian firm with good returns.

KEEN EYES—GOOD PAY

Main qualifications for the job are a pair of keen eyes and the patience to sit in a plane or blimp for several hours on end. Those of you who have had previous experience in deep sea fishing, so much the better, though this is by no means a prerequisite.

The pay will probably be good. The aforementioned Seaplane Fisheries Service, Inc., contracted for payments at 20c per ton. A typical school of sardines located by air yielded 6,038 tons—1,053 of which were pursed the same day the school was reported. Competition after the war will probably lower this figure, but it looks like a field well worth investigating.

AVIATION DEPARTMENT
UNION OIL COMPANY
OF CALIFORNIA
76

Since its incorporation in 1890, Union Oil Company has remained a leader in the field of petroleum development and product research. Its petroleum fuels and lubricants, sold throughout the five Western States, Alaska and Western Canada, are known for their high standards of quality. Today—as it was over a half century ago—Union Oil Company is still independent, the largest independent oil company in the West.

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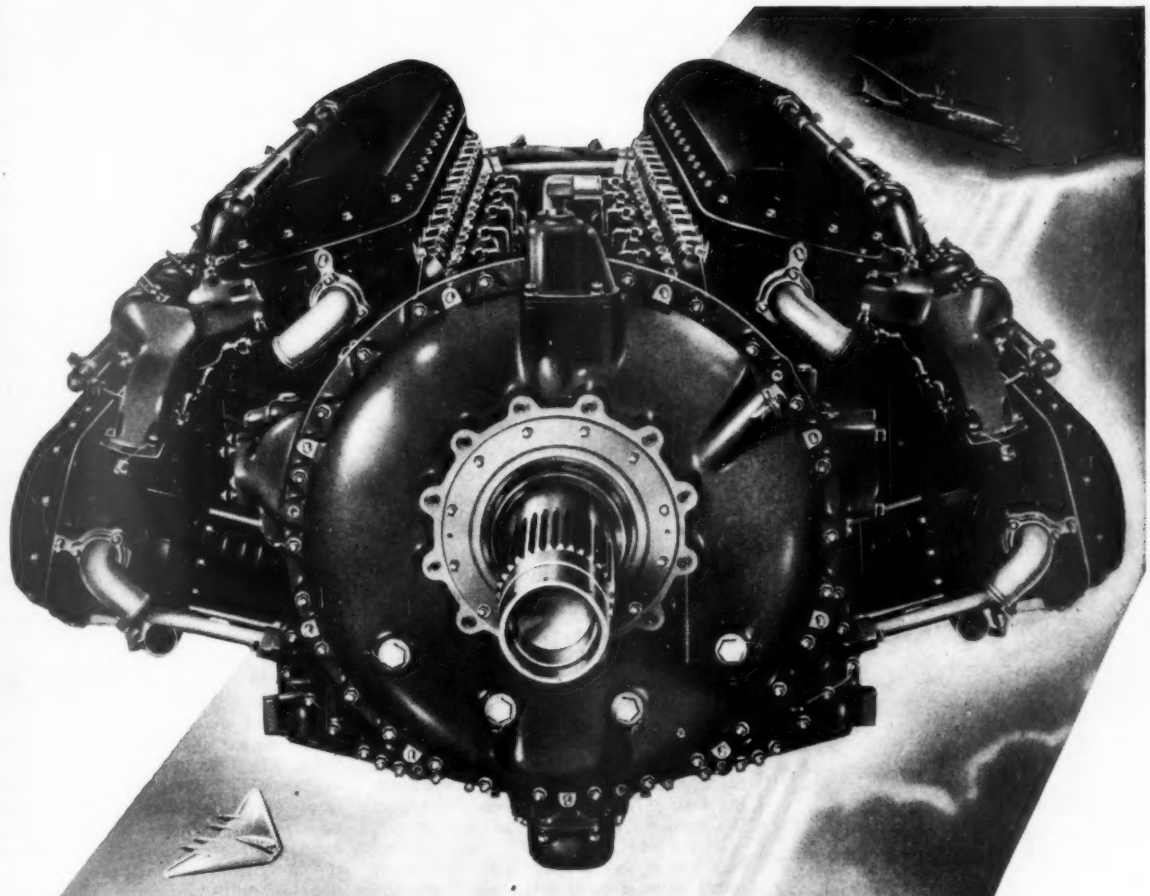

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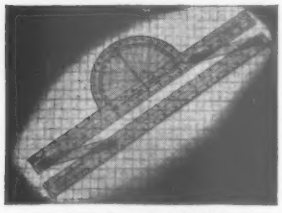

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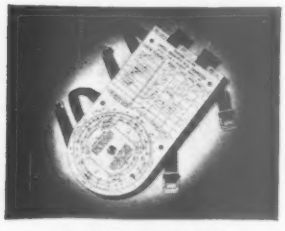

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(*Continued from page* 118)

would much more likely be in the foxhole or on the wooden bench watching the open air movie than striking poses in the newsreel that was being shown on the screen.

The Army Air Forces recognized his daring. When COMAIRSOPAC (the South Pacific likes its initials too) was honored by USAFISPA, United States Air Forces in South Pacific Area, the citation accompanying the Distinguished Flying Cross medal read: "Vice Admiral Fitch, in his capacity as Commander Aircraft South Pacific, performed numerous hazardous flights in the combat zone of the Solomons Area and the Coral Sea for the purpose of inspecting air activities and incident to the selection and development of bases—"

He was among the first ashore when Munda was seized. In the rough days at Guadalcanal he landed time after time on Henderson Field while the Japs were firing mortars down the strip. The first plane to use the New Green Island base was a *Catalina*. At the controls on the journey out was Admiral Fitch himself. In the blister hatch his friend "Billy" Halsey was having his usual wonderful time, being far too much interested to come forward and get into his safety belt for the landing. Along with General Gieger, the two admirals made their inspection and on the way back were joined by four *Corsairs*, whose pilots, not knowing about the braid aboard the patrol plane, preceded them into the home landing strip. Admiral Fitch doesn't expect the band out every time he turns up.

By the way, he has one. The advantage he takes of the fact that a three-star admiral rates a band is to use it for the pleasure of his men. Once when the admiral felt that the flyers at his most advanced outpost were getting pretty tired from the daily strikes on Rabaul, the canned meat, the land crabs in bomb shelters, and scorpions in their bunks, he bundled his band into a *Skytrain* and took it along. They couldn't bring the piano, but they had a concert guitar and vibraphone. To the tired men, so far from home, it was just what the doctor ordered.

On a stage framed by the gigantic roots of a banyan tree, a white-garbed, sweating sailor stepped up to the mike and boyishly babbled into it a first rate imitation of Sinatra. During the applause following "I Wish I Had a Paper Doll to Call My Own," Fitch and Halsey, khaki-clad, slipped in at the back. They got to their chairs quickly, adding to the general merriment two unaffected grins. Their presence made the scene even stranger, for in the rear not 20 feet away from the "rank" stood two gigantic Fijian scouts, having the same trouble with their feet as the swaying officers and enlisted men up front. Not so the lone sorrel-topped fuzzy-headed Melanesian between them. Dressed in a very scant red loincloth he stood stock still, gazing at the spectacle before him with stony face. When it was over, he stalked off into the jungle.

The black warrior wasn't being difficult. One of the treasures the admiral brings with him from the South Pacific is a placque on a wooden shield presented to the United States Navy from the people of the Solomons. The actual lettering had been done by a Chinese, the mother-of-pearl inlay by the natives.

Not only was the admiral concerned with matters like the band and movies; no detail of his command escaped his notice. He made it a point to find out for himself if the men had enough handball courts, if the Ships Service was open at hours when they could best use it, if there was enough pogey bait—candy—for all. He saw to it that the ice cream machine was putting out its three-ton maximum of gedunks every week.

There is probably no other Naval officer anywhere so genuinely liked and admired both by regular Navy and Reserve officers as Admiral Fitch. They like him for the same things. Born in 1883 in a small Michigan town of parents newly arrived from England, he is democratic and unpretentious. His favorite song is "God Bless America." His favorite reading matter consists of Navy reports and intelligence bulletins from other theaters, but if there is time left over for pleasure it will probably be Zane Grey.

Admiral Fitch sticks to his trade—fighting, with his fists if need be. His appearance gives no hint of the rough sea captain. He is of modest stature, meticulous in appearance, and so kindly disposed and quiet in behavior that you would never associate him with bloodshed. The Japs do. So did his classmates at Annapolis. When the admiral arrived at the Naval Academy in 1902, a midshipman brought along with him from St. John's Military Academy in Wisconsin the story that little Aubrey had licked the class bully in defense of a Jewish kid named Jakey. They didn't believe it but they were convinced when he remained undefeated boxer of his class all through Annapolis. Thereafter *he* was known as "Jake."

At his camp in the South Pacific he suggested that his officers keep in shape. He installed a punching bag, came out garbed in shorts to show them how. They saw deft fists fly like lightning. Their 60-year-old instructor explained that it was good exercise.

Stories of the admiral's personal courage are common knowledge throughout the Solomons.

After the attack on New Georgia, the commander of South Pacific Air wanted a look at Rendova. So he started out on D plus two day with his pilot, Lieut. Willard King in a *Duck*, which is a general utility plane. King became a trifle nervous about his admiral confined beneath the greenhouse in the rear seat. He called back a reminder that the little amphibian packed no guns, and at that moment they found themselves flying under assorted dogfights. For emphasis a plane crashed just off their starboard beam.

Said the admiral, "Where's that automatic rifle you always carry?"

King held it up.

"Pass it back!" He pulled back the hatch, sitting there with the gun across his knees, quite free and easy in his wrinkled britches, his shirt opened to the wind

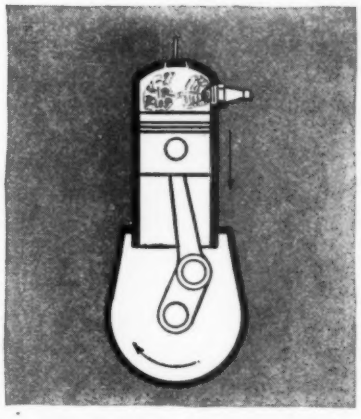
(*Continued on page* 126)

New Flight Instrument guards against fuel waste!

ECONOMY

M.I.T.-SPERRY DETONATION INDICATOR INSURES FUEL ECONOMY . . . LONGER ENGINE LIFE . . . GREATER SAFETY

1. THE ENGINES on this airplane may be detonating, but the pilot has no way of knowing. Detonation means *destructive combustion*. In your car, you can *hear* detonation. In aircraft, the noise level is too high.



2. DETONATION increases internal temperature and pressure tremendously. If continued, it damages engines, may cause failure. How is it possible to tell when detonation occurs in flight?

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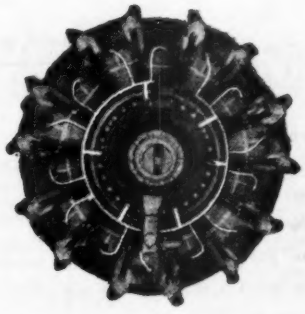

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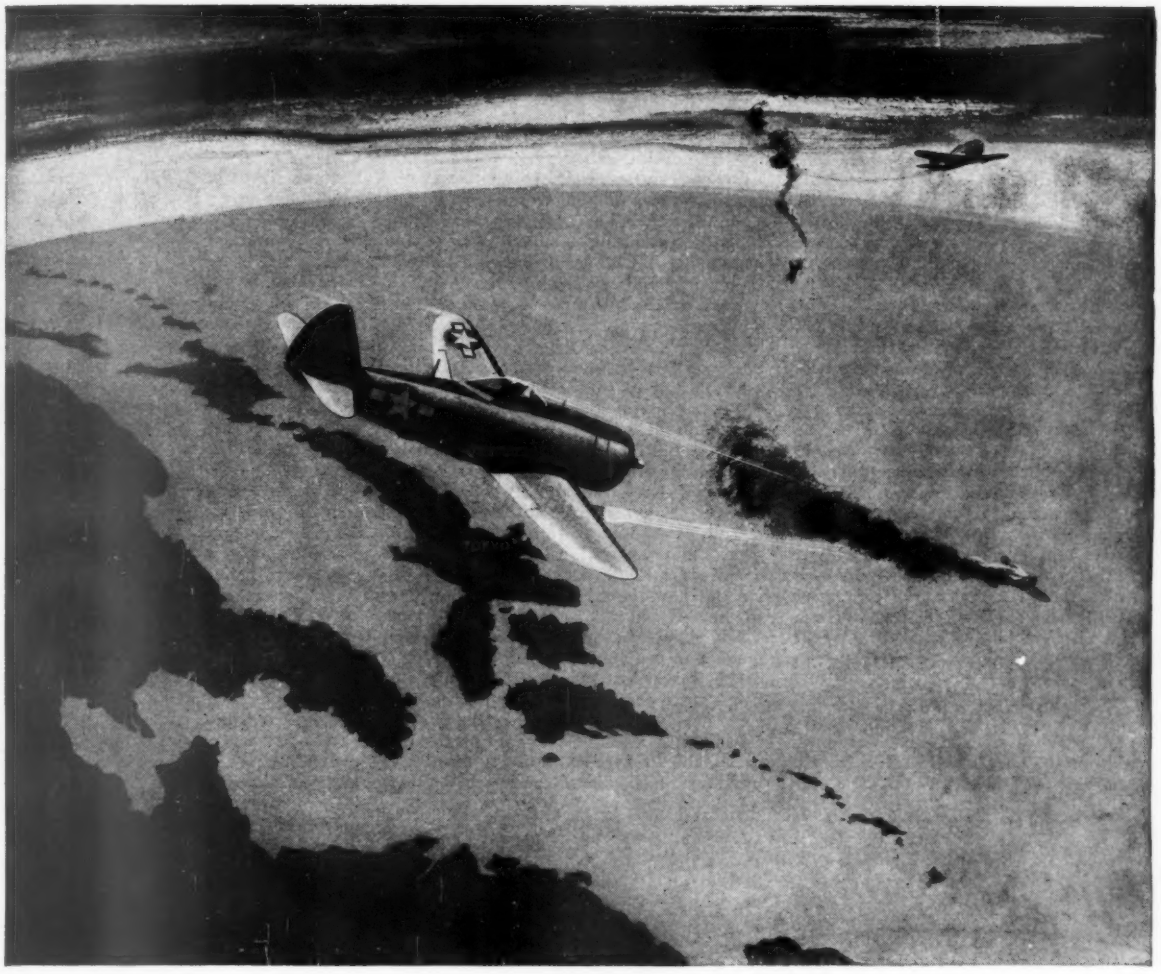

ZERO HOUR

While Republic Thunderbolts have been busy hammering the Nazis in Italy, escorting bombers to Berlin, tearing up railroads and bridges in Normandy and clearing paths for our liberation of France, they have also been moving in on Tokyo.

Since August, 1943, Thunderbolts have been steadily filtering into the ever-narrowing, island-by-island ring of strangulation which is closing about the Jap empire. It has been just a year since an AAF colonel helped introduce the Thunderbolt to the Zero by downing six Japs in a mission over Wewak.

Today, Thunderbolt pilots are fighting, dive-bombing and strafing the Jap from New Guinea all the way to Saipan and Guam. They are also taking his measure from bases in India and Burma. And in China itself they are guarding from attack the advance bases from which the giant B-29's "commute" to Tokyo and Nagasaki.

Where the Thunderbolt is going to show up next, only time and your daily newspaper will tell. But at the Zero Hour, when the ultimate and conclusive strike topples the towers of Tokyo in smoke and flame, you can depend on it: *Thunderbolt pilots expect to be there!*

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Republic *firsts* in war point to *firsts* in peace

REPUBLIC AVIATION
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(*Continued from page* 122)

and the tropic sun. "Now we're ready for them," he reassured his pilot. "Quit worrying."

The admiral's casual attitude toward danger has had its effect upon the men under him. They play down their own accomplishments. If you talked with the Marine Maj. Joe Foss, considered by many airmen to be the most brilliant single combat flyer this war has produced, you'd hear no heroics. Kills go to his outfit. So Blackburn, skipper of VF-17, one of the hottest Navy squadrons to date, will suffer no gabble about "aces" and who got the most. Don't people know this is World War II where the strategy of combat demands teamwork?

But Admiral Fitch can not resist bragging on them a little. "Think of it," he said, in the nearest tone he ever gets to unrestraint, "not so many months ago these kids were civilians in the Middle West maybe, or in the deep South. Some of them had never seen the ocean. Now they're flying over waste-track waters. Don't forget that in this respect the captain of a plane is equal to the captain of a ship. It's his responsibility whether he gets through or not; it's his brain that determines if his ability to navigate can hit it on the nose."

He wouldn't be Navy if he didn't think the longer training given those Navy flyers and their down-to-earth bombing make them the best in the world. But he will permit no bickering about Army versus Navy flyers. "After all," said the admiral, "they're all one breed of cat." That's something for the men in the different services to remember. That attitude and Jake Fitch's warm personality explains how he was able to handle his ticklish administrative job.

His pattern for administration is so simple and reasonable it works. To begin with, the admiral as head man always accepts responsibility, never passes the buck. He isn't prone to change his mind, though he gives all sides a chance at argument in advance and does listen to their advice in forming his original plan. Again, he always knows *why* he does something. And he's just as loyal down as he is up.

The Fitch idea of co-operation is not the usual one of expecting the other fellow to do all the work while you get the glory; rather he delegates authority fairly and gives credit where it is due. At his advanced operational posts he rotated Marines, Navy, Army, and New Zealanders until they learned to take orders from each other as well as give them. He didn't just talk about co-operation; he stirred the different services together until they jelled.

The dignity of his position has never made him too lofty to take a little kidding. Take Jack, his youngest. Admiral Fitch has a charming wife and three fine sons. Though none of the boys have eyes that will meet Naval Academy standards, today all three are USNR and in there pitching. Jack, now on a destroyer, was once stationed near his father's island command. He asked the admiral over to chow. "Let you see how the other half lives," he said. The admiral stood in line in mud up to his shoe tops to get his tin plate filled with beans, but he *did* want to sit down to eat. Jack suggested his tent, which for refinements had Army cots jacked up on blocks to keep the mattresses out of the water. When his father finally remarked upon conditions, Jack shook his head pityingly and sighed, "Gee, Dad, you're getting old. You can't take it any more."

The admiral can take it, and does. At Pensacola his face got very red about a perfect landing he made on the Langley's flight deck—perfect except that he forgot to let down his hook. He thought he had outlived it until a certain Army Air Forces general brought it up at the admiral's "sing." Asked to contribute his bit, he gave out with an old Air Corps song, the one that goes:

Come on and get promoted
As high as you desire;
You're riding on the gravy train
When you're an Army flyer.
But just when you're about to be
A gen-er-al you'll find
That your engines cough
And your wings come off,
But you will never mind . . .

The crowd liked the song, and the general wooed the muse that night. Coming back another day, he was asked if he knew any more verses of the AAC song. The general said, "Why, yes," and piped up:

You're flying o'er the Langley,
A gray-haired ensign bold,
To set her down upon the deck
Is just what you've been told.
You bring her round at proper height,
The flagman gives the sign,
But your goose is cooked
You have no hook
But you will never mind . . .

There was more Army-Navy unity in the laughter that ensued than in a hundred formal resolutions.

The meaning of harmony among the services can best be glimpsed at the Admiral's mess. Around his board, seated with no great emphasis on protocol, might be Capt. Lucian Moebus (Navy), Col. Clayton Jerome (Marines), Col. Oliver Picher (Army), Capt. George Van Deurs (Navy), Air Comm. Sidney Wallingford (Royal New Zealand Air Force).

Talk is free and natural. A commander whose love of deep sea fishing has furnished the evening meal with the big one now reposing on the platter, is in for a ribbing as a loafer. Someone asks a New Zealander why they can't fly in a few of those thick juicy steaks from Auckland. "You're keen on them?" inquires the man from Down Under. Surely you wouldn't expect our chaps to fly them in *Warhawks!* They're so slow the undercuts would spoil. Now if you'll let us have a few *Corsairs. . . .*"

Admiral Fitch, a quiet man, listens to the helter skelter of conversation. He hears a general called an admiral, a Navy captain a colonel. He might observe with pride that it's the only place in the world

(*Continued on page* 130)

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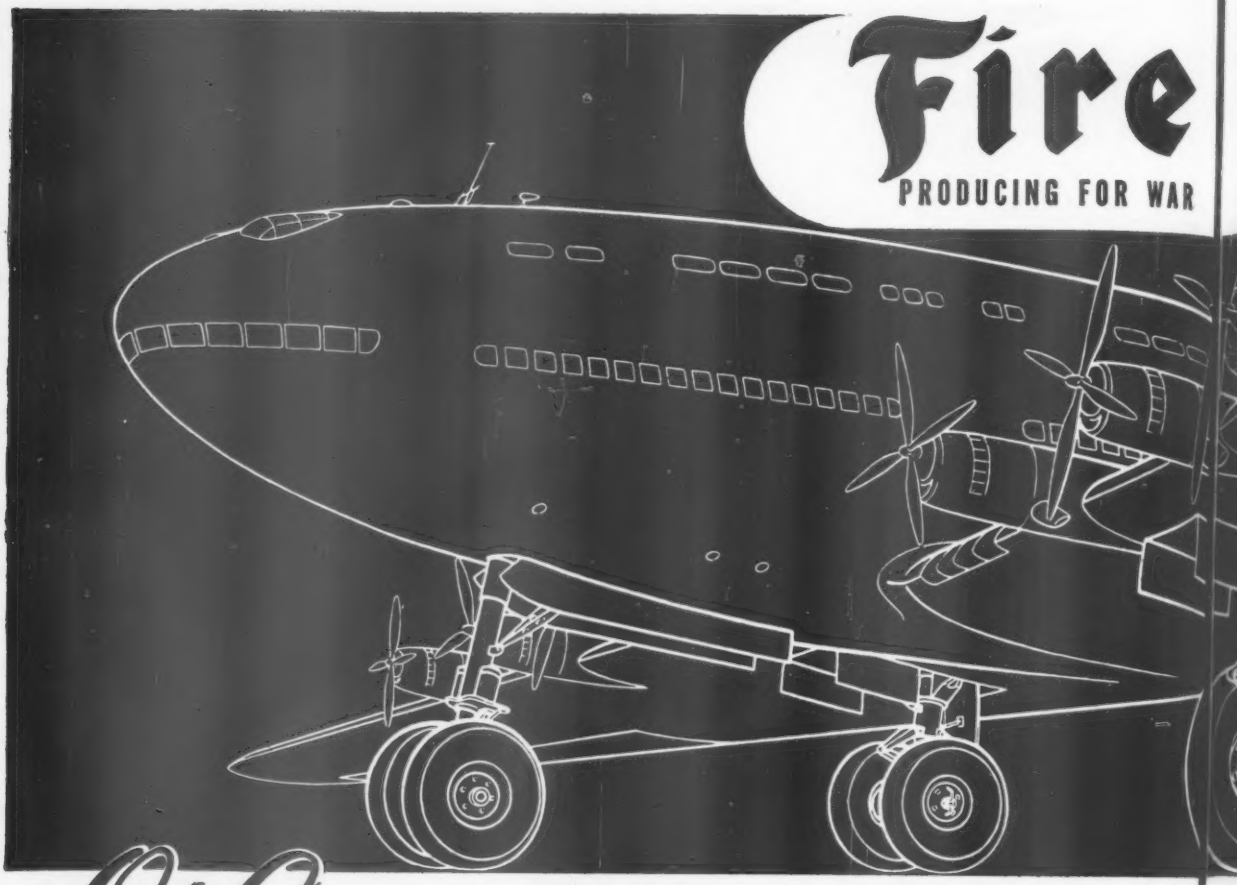

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But HOW ABOUT ON THE

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(*Continued from page* 126)

where such slips are passed over as unimportant!

The same mixed command occurs the following morning, when composite squadrons, out on strike, roar overhead. One of these strikes will contain: *Liberators* (Army), *Dauntless* dive bombers (Navy, Marines), *Avenger* torpedo planes (Navy), *Lightnings* (Army), *Corsairs* and *Hellcats* (Navy, Marines), *Warhawks* (New Zealanders). As they rendezvous out above the ocean, the pilots, like their elders at the Admiral's mess, needle each other over the frequencies. "How they comin', Low and Slow?" an Army *Lightning* asks the Navy dive bombers. "Not bad," is the reply; "are you sure you sorry characters are quite comfortable in your high-altitude foxholes?" A squadron of dive bombers, led by a Marine major, circles three times over the target, searching for a hole in the clouds. Things are tense. Then comes the Southern drawl of a Navy ensign: "Lookahere, Major, either *do* somepin, or get off the potty." A New Zealander, flying an outmoded *Warhawk*, salvaged from the scrap-pile, calls upstairs: "Hey, Yanks! I've got nine Zekes *cornered!* Come on down."

The new Deputy Chief of Naval Operations will miss these men. He'll miss going forward with them. For him the hundreds of hours in cockpits over enemy territory will dwindle to the minimum flying time which the Navy demands of its deskbound airmen in order to keep their hand in.

But at home he is greatly needed. Foremost in the list of his achievements stands the unique contribution Admiral Fitch has made to this war: he has demonstrated that Americans can fight together with their Allies against a common foe and not fight each other.

He may be able to prove it all over again in Washington. .END

Our Captured Airmen

(*Continued from page* 34)

There appear to be at least five permanent camps for airmen. They are called *Stalag Luft* (or air camp) and are given a number. In addition, there are groups of airmen (some as large as 500) in other camps. *Stalag Luft I* is believed to be near Rostock, across the North Sea from Denmark; *Stalags Luft III* and *IV* are near Sagan, not far from the old Polish border; *Stalag Luft VI* was reported far to the north at Heydekrug in East Prussia, close to the Lithuanian border. Presumably it will have been moved by now because of the Russian advances. *Stalag Luft VII* is at Bankau, near Kreuzeberg, in Upper Silesia.

Stalag Luft III is best known of all the air camps. It is one of the oldest and it is believed to be the largest. Some Americans have been there more than two and one-half years. On May 31, just before the big Allied offensive, there were 2,837 Americans there. Most of the other prisoners were British but they lived in separate compounds and could not communicate with the Americans. By July, airmen in German camps outnumbered British aviators for the first time.

Like most German prison camps, *Stalag Luft III* is enclosed with a high barbed wire fence. Guards are posted in towers at strategic intervals and there are the usual searchlights for night watch.

As one pilot explained, "We run our own little socialistic world. Everything is shared. We have our own commanding officers, block commanders and so on and everything is run along much the same lines as an American army camp—except that you can never get leave. Complaints, questions and requests are made first to your own senior officers (the camp spokesmen) who in turn communicate them to the German commanding officer."

The camp spokesman—at an officers' camp he is the ranking officer, at an enlisted men's camp he is elected—is the liaison man who talks with a Red Cross delegate, who comes on periodic visits. The camp spokesman may correspond freely with the Red Cross and may discuss matters in private with the delegate when he arrives. Discussion may range from complaints about the drainage system to requests for emergency equipment. He sees to it that relief supplies are fairly distributed, he checks to see that shipments are received intact. He usually runs a lost-and-found office as a sideline to his administrative job.

Officers are not required to do any work. Non-coms act as orderlies for the officers. Non-coms can also volunteer to go on work detachments but few do. Enlisted men are required to work. If they work inside the camp on its maintenance or on construction they get no pay. If they go out on work parties they get 70 pfennigs a day (about 28 cents). Most of *Stalag Luft III* has been built by prisoners.

Mail from home is the most important episode in any day at a prisoner camp. There is no limit to the number of letters a prisoner may receive and no restriction as to the persons who may write him. All mail to and from prisoners is sent postage-free. A prisoner may write three letters and four postcards a month if he is an officer; enlisted men are permitted only two letters and four cards. Paper and cards are supplied by the Germans—an effective way of limiting the length of letters. Once in a while there is a paper shortage—then each man's quota is cut. Mail both ways is censored by both Germans and Americans. Men must be careful never to write anything the Germans want to know or that might make them angry. Letters to prisoners must not mention war news, sailings or transfers of service personnel, names of casualties, criticism of any government, any form of enemy propaganda, quotations from books or other writings—in other words, only home and neighborhood news is permissible. Four months or more from the time a man is captured he gets his first letter from home. Letters to the States are delivered in about two months. Airmail letters from home usually take two months to arrive.

All mail for air camps is censored at *Stalag Luft III*. The staff of 60 censors there is often several weeks behind in checking letters. The family that innocently sends its boy a letter every day inadvertently holds up mail for him as well as for his prison mates. Letters never have any American postmarks—German censors would not pass envelopes bearing patriotic slogans such as "V For Victory." To avoid this, letters written to prisoners may either be mailed direct

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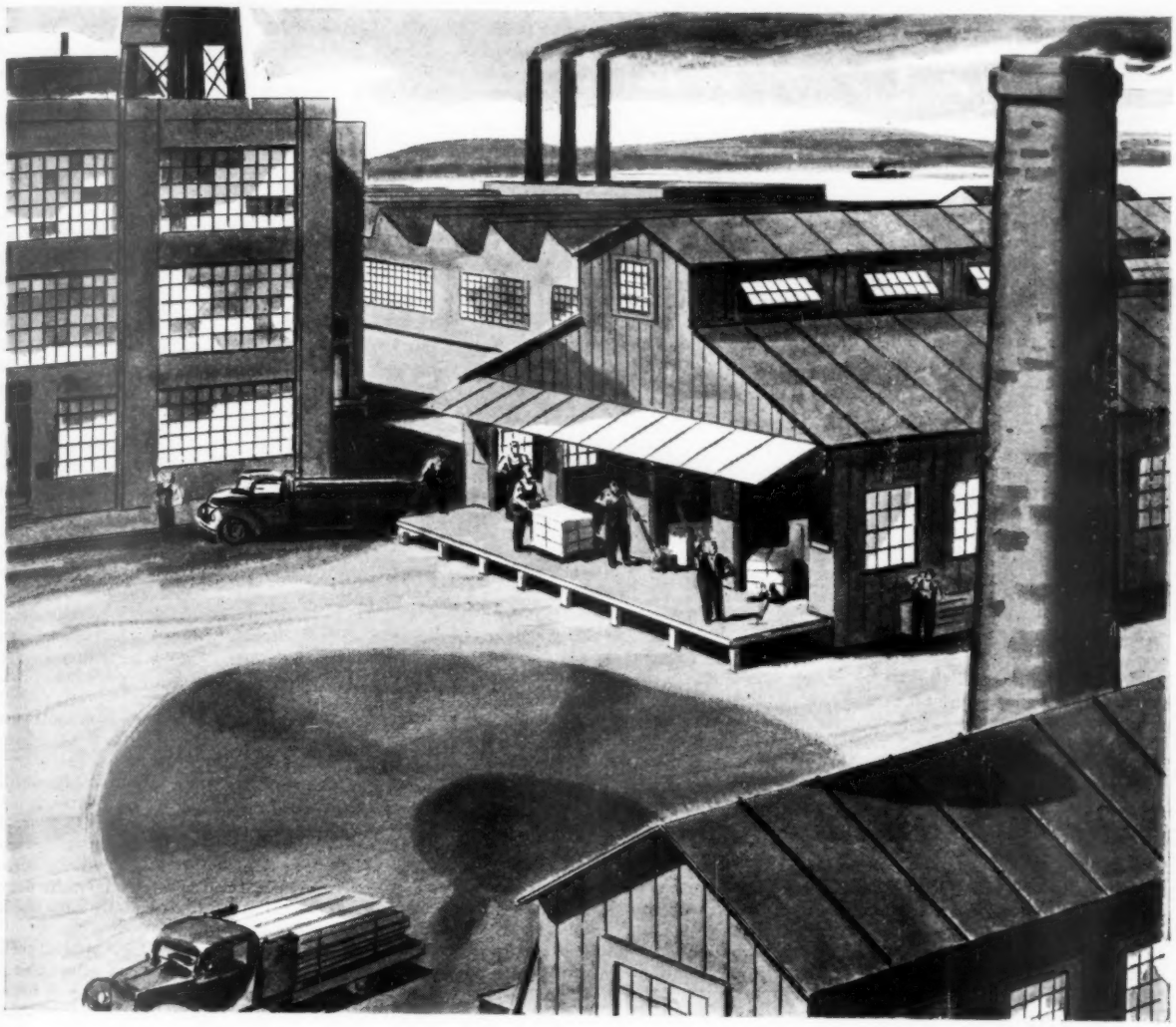

THERE'S SOMETHING IN THE AIR . . .

THE SHADOWS of slowly descending helicopters will be a frequent sight in the peacetime years to come . . . but only after the war will you learn *all* of the progress in design and the engineering improvements that have *already* taken place. Today's "in the air" performance of several successful helicopter types is known only to the Military Services . . . but in the tomorrows to come it is likely that the ability of helicopters to land and take off vertically . . . to fly rapidly or hover in the air . . . will find many commercial, personal and industrial uses. The patrolling of forest areas and ranches, the inspection of cross-country power and pipe lines, spraying crops, servicing inaccessible places far from airports, are just a few of many useful applications of the helicopter. Kellett's expanding engineering staff looks with anticipation to the future . . . when modern helicopters will bring you one of the most progressive developments to come out of this war. Kellett Aircraft Corporation, Upper Darby (Philadelphia), Pa.

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to the post office or sent in an extra unsealed envelope addressed to the Chief Censor at New York, who will forward it without a postmark. No V-mail can be sent to prisoners of war.

Stalag Luft III has five compounds. There are about 15 barracks in each. There is a large parade area where men assemble for roll call twice a day, a ball field and a volley ball court. The water reserved in case of fire is a makeshift swimming pool. Food, furnished mostly by the AAF and delivered by the Red Cross, is adequate. Groups of six or eight men form combines and pool all the food rations. Each has his turn at being cook and dishwasher.

Barracks for officers at *Stalag Luft III* are divided into rooms with six to eight men sharing a room. The barracks has a central living room. Eighty enlisted men are assigned to a building. They sleep in double-decker bunks. Mattresses are filled with wood fiber and each prisoner is given two blankets. The 12 to 16 wash basins and the lockers for the men are in the middle of the building. Prisoners are usually able to get one hot shower a week. There is no dining room and food is usually eaten in the dormitories.

A typical dinner consists of corned beef, fried potatoes and pudding, plus German army bread; for lunch, "Reich soup," made from dehydrated turnips, beans or peas; breakfast is bread and coffee.

At some camps permission has been granted to keep on hand as much as a three months' supply of AAF food packages so that delays in transit or an unexpected influx of new prisoners won't mean that the men go hungry. The German rations they get are supposed to be equivalent to those allowed for German soldiers not on active duty. But Americans in the camps agree that they'd be pretty hungry without relief food.

The AAF packages contain sufficient food value for a week and they are distributed every seven days. The German authorities, together with the camp spokesmen, keep strict control over these supplies. The food parcels are locked in a storeroom which is opened by them jointly. The men may take from their parcels whatever food, soap or cigarettes they need for that day, after which the storeroom is again locked. Each tin of food taken out is promptly punctured so that it won't keep long enough for any prisoner to accumulate a hoard of food sufficient for an escape.

Most of the men complain of the shortage of cooking equipment but the Germans declare they have exactly what German soldiers get. Tins in which some AAF food is packed become metamorphosed into pots and even stoves. One man writes:

"Made a cooking stove out of tin cans. It cooks our meals and boils water for coffee at the same time. It has an oven in which we bake cakes. We cook our supper outdoors every night and the parade ground looks like a cross between a hobo jungle and a sanitarium. We have planted a vegetable garden (seeds from the U. S.) and expect to be able to vary our menus considerably throughout the summer."

Perhaps more important than the vegetables, gardening gives the men something to do. Cooking, laundry, and barracks details leave far too much spare time. Dramatics at *Stalag Luft III* are well organized. The men have built themselves a theater and hold regular performances. Seats are made of Red Cross boxes. Sets had been created from the omnipresent boxes, cardboard, newspapers, magazine covers, book jackets, etc. Stage lights are made of old tin cans. Costumes are improvised and, rather than let themselves be stopped by the lack of wigs, some of the actors have let their hair grow long! Movies are shown, but two in four months is apparently a lot. Sports equipment, musical instruments and indoor games are sent by the YMCA.

Libraries have been set up by the prisoners, stocked in some cases by the five-pound book parcel each prisoner may receive each month. The books must be new, mailed direct from the booksellers. They must not be by an emigre from German-held territory, nor deal with the war, criticize the Axis, or even extol democracy; they must not be travel books, have maps or charts and they cannot be spy stories. Inexpensive reprints of prewar books get by usually without question. Expensively bound editions don't pay. They use up weight and are often damaged by the censor's search for illicit material possibly hidden in the elaborate bindings. A close check is kept on the parcels sent each prisoner and if more than one book package arrives during the month only one is delivered to the prisoner. The rest must wait till the following month.

For news of the war the men must depend on what they learn from new arrivals at the camp, plus what they choose to believe from the German newspapers which they are given. But they do manage to keep informed and to pass the good word on. "I hear that Mrs. Stalling Grad has recovered from her attack of German measles" one prisoner remarks in a letter home. Later he explained that since he was allowed to listen to the German radio, he had a very "clear" understanding of what was going on. Newspapers may not be sent to prisoners—not even old newspapers used to wrap breakables in packages from home.

The Germans issue a camp newspaper every two weeks. It circulates from one prison camp to the next and contains general information, news on repatriation negotiations and other matters of interest to prisoners, carefully selected world news and official notices. It usually runs about 10 pages.

At *Stalag Luft III* the men publish their own paper. It is a one-copy affair posted on the bulletin board, made up of home news, jokes, a health section, sports, music and book reviews, cartoons and a cooking section ("How to convert Red Cross sardines into fresh trout," for instance).

Every 30 days a prisoner may receive a carton of cigarets, and every 60 days his folks receive from the War Department the official label which they need to send him a package. Packages must be 18 inches or less in length, which, added to the girth, must not total more than 42 inches. They may contain no tins or glass. They are examined by censors here, and when they arrive at the camp they are opened by a guard in the recipient's presence. Occasionally the guard confiscates something but always gives the owner a receipt. With the valuables taken from him at the time of capture, it will be returned to him when he is repatriated.

The Foreign Economic Administration periodically lists the things that may be sent. Clothing is allowed, although necessities are usually covered by the supplies of Army clothes forwarded to the camps through the Red Cross. But here again transportation difficulties and the

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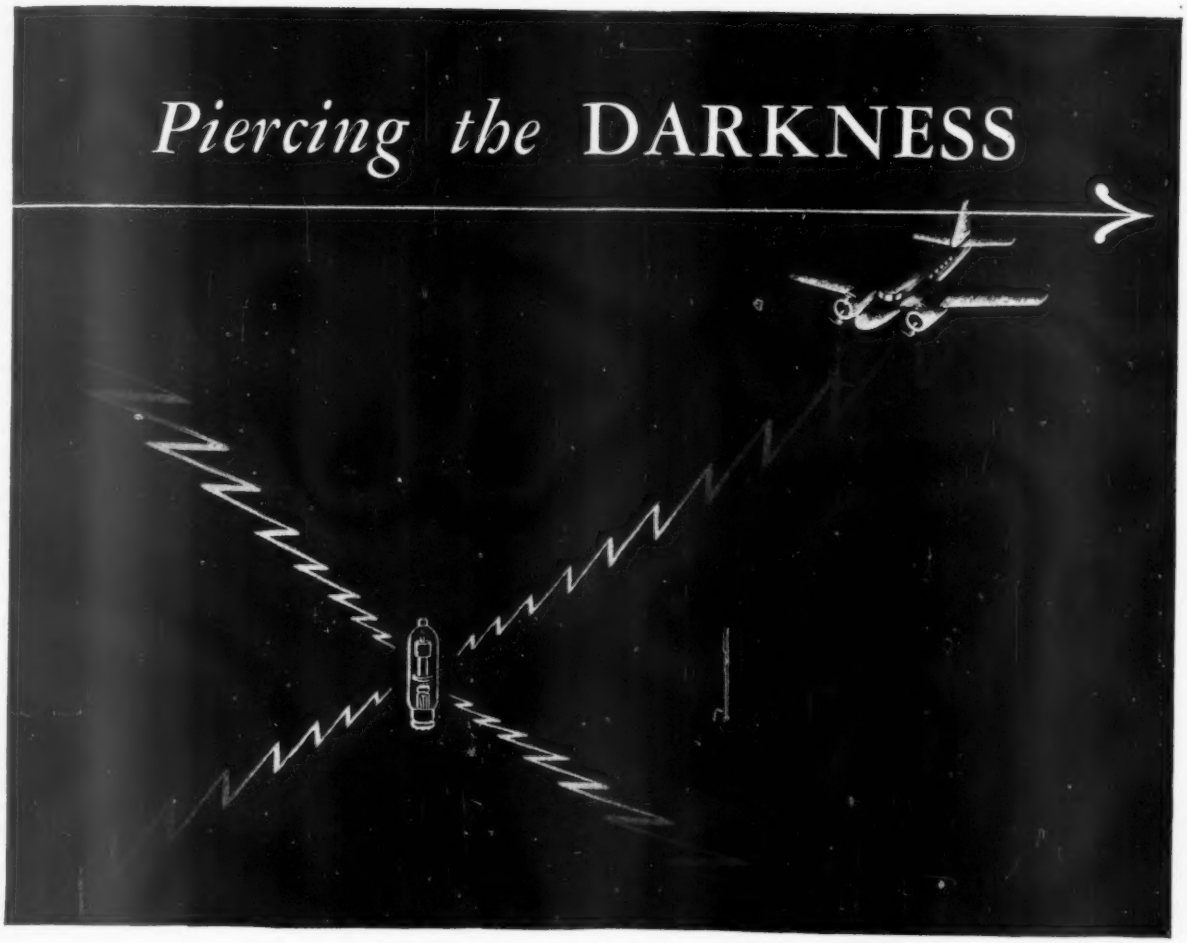

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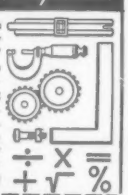

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increasing number of prisoners can cause trouble. Though this letter is exceptional, it shows how bad things can get: "It's been almost one year now that I've had only one pair of pants, one set of underwear, and a couple of pairs of socks. You can imagine my condition when I wash anything, and the state of my clothes."

Dried vegetables, soups and seasonings —especially onion flakes—are popular. Pepper is not allowed. Relatives are advised not to send cakes, since they must be sliced and examined by censor. Small musical instruments, fountain pens, watches, pencils, paper, and pipe cleaners are among the allowable items. Money and matches are forbidden.

At *Stalag Luft III* the prisoners have worked out an exchange system they call the "Foodacco." Barter is done on point values. Chocolate rates 37 points per quarter pound. Cigarets are worth 40 points per 100. Sometimes an unscrupulous character can make quite a haul. "Market confidence," wrote one officer, "and particularly in broken lots, has been seriously undermined by a shark who dealt in tins of 'love apples' (tomatoes) which were relabelled 'beef roll.' Pancake mixtures and coffee were very low on an overloaded market; while spreads (jam, etc.) reflected the paucity of what one puts them on."

Camp canteens have practically nothing to offer. Prisoners are limited to three cigarets daily, and one razor blade and two boxes of matches monthly. Beer is not limited. Men can buy things at the canteen with the prisoner of war money or scrip which they get each month. Its paper value is the same as the salary of a Luftwaffe lieutenant would be. The men on work details are paid in the same prisoner of war money (currency would be an aid to escape). Some of the men are quartered near their jobs, others go out from the camp each day. They may be required to do any work not directly connected with military operations.

While a U. S. airman is in prison, his full pay, including flying and overseas allowances, are accumulating here to his credit. The time spent in prison is considered active duty when it comes to computing retirement pay and the five per cent increase after three years of service, as well as service stripes.

The most popular time-killer for the men who must wait out the war has proved to be study. Organized classes sometimes cover 100 hours a week. At first the study groups centered on things the various prisoners knew. Discussion centers on various subjects chosen by the prisoners themselves. They might range from philosophy to colonial politics, from languages to the history of art.

It wasn't long before the discussions grew into full lectures. Courses, terminating with examinations sent from home schools, were drawn up. Textbooks are supplied through the YMCA and the European Student Relief Fund.

It is his study program, more than anything else, which lightens the prisoner's feeling of futility and waste. With it he can look toward the future, knowing that the day will come when he can go back into the free world—and that he can face it with better equipment than before. END

Simplification of Aircraft Control

(*Continued from page* 118)

are so inherently stable that they are certificated by the Civil Aeronautics Administration as "characteristically incapable of spinning." This safety feature eliminates one of the greatest hazards for the private pilot, which, according to one aviation authority, has been the cause of 70 per cent of fatal or serious injuries to pilots or passengers of private airplanes. Paradoxically, many experienced pilots object to this safety feature, pointing out that students learning to fly on these airplanes will never know how to recover from spins in more maneuverable aircraft. This criticism overlooks the fact that the majority of private pilots will prefer to fly safe, *nonspinnable* aircraft and the need to know how to recover from spins will therefore be nonexistent.

The only other criticism against simplifying control of aircraft also comes from pilots, who point out that it is impossible to side-slip two-control airplanes. The *Skyfarer* type of aircraft is equipped with landing flaps which permit it to reduce speed and increase its rate of descent while holding normal flight attitude, without loss of control. This function of the flaps eliminates the necessity for a sideslip; but if it became necessary to lose altitude sharply in landing, it is always possible to execute S-turn approaches. The tricycle landing gear with steerable nosewheel and wheel brakes also provides the tremendous advantage of permitting the pilot to land fast and apply the brakes without danger of nosing over.

The ability to pilot high-speed, combat, or racing aircraft will always require considerably more experience and knowledge than the average private pilot will ever be required to have. A parallel might be drawn from the fact that few of the automobile-driving public are sufficiently qualified to drive a racing car in the 500-mile speed classic on the Indianapolis Speedway. In the private airplane, the controls must be simple enough to appeal to the average automobile driver. A single hand wheel resembling an automobile steering wheel should control all directional movement, both on the ground and in the air.

Elimination of the need to steer with the feet is the first logical step towards simplification. There is no aerodynamic or mechanical reason why this complex type of operational control should be retained in personal aircraft. By eliminating foot steering, the manufacturer will have so simplified the technique of piloting that he will open up a new and vast sales market for private aircraft, which in turn will open up the skyways for millions of Americans who have not yet flown their own planes. END

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4 **MEETING OF CAPTAINS**—Give a powerful presentation of the importance of the work assigned to them. Instruct them in sales procedure. Have them carefully study the Treasury Booklet, *Getting the Order.*

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(c) *Competitive progress boards.*
(d) *Meeting schedules, etc.*

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8 **ADVERTISE THE DRIVE**—Use all possible space in the regular media you employ to tell the War Bond story.

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Flexibility of Air Power

(*Continued from page 23*)

Throughout history, inconclusive peace terms have always followed battles which have been victories in themselves but were not followed by a drastic pursuit so that the beaten enemy never had a chance to make another stand. This is what happened in 1918.

The great question is whether the pursuit of the German forces defeated in France can be kept up with such determination and speed that the Germans will not have a chance to make a stand even on their Siegfried fortified line. If possible, our pursuing ground forces must be so supported by aviation that when that fortified line is reached, the pursuers will be so mixed with the pursued that both will enter this line together and it will fall to us immediately.

We are forming a new air-borne army made up of air-borne divisions and parachute troops. General Patton has proven in this war that he has the necessary dash and determination. Should the air army and enough fighters and fighter-bombers be added to his present command of armored divisions, he will have a force which may well give him the opportunity to carry out a decisive pursuit. To give Patton such command means making the fullest of aviation flexibility for tactical purposes.

The Nationalist pursuit after the victory on the Segre River in 1939, which was kept up constantly and relentlessly until the remnants of the Loyalist Army had been destroyed or driven across the Pyrenees into France, furnished the model which has been followed by the Russians again and again in driving the Germans from the heart of Russia to their present position on the borders of Germany proper and the Carpathian Mountains.

In any pursuit, the great difficulty for the pursuing forces is to catch up with the enemy troops which are running away to save their lives or to keep from being captured. This means that only the swiftest units can catch up with the pursued. Paradoxically, the swiftest are those with the least ability to fight because armament and armor have been sacrificed to speed. Therefore, after the pursued have gained a certain distance, they have time to settle down to a new defensive position because their artillery and machine guns and tanks, being stronger than the swiftest units of the pursuers, can stop these units. By the time the heavier fighting units of the pursuers get up, the enemy has had time to prepare to fight another real battle.

Aviation used to bomb positions miles to the rear has no influence on such a situation. Aviation used to bomb communications of the retreating enemy undoubtedly does considerable damage—but it does not stop his retreat and it does not prevent the enemy from settling down in a new position to fight again.

But aviation, working in the closest support of the pursuing troops, can give these swift light units the necessary fire support to enable them to keep on going and prevent the enemy from ever settling down into a new position to fight another battle. Its bombers used as flying artillery can furnish the heavy fire which the artillery, still well to the rear, cannot furnish. And its light bombers and fighter machine guns can furnish the needed fire which the heavy tanks and heavy machine guns, also still too far to the rear, cannot provide.

It is this flexible use of aviation to provide the fire necessary for every situation which may arise on the ground, learned by the Russians in Spain, which is necessary if the pursuit in Germany is to be decisive.

When Germany is out of the war, the next great question is how best to use the enormous American and British aviation forces, and it is hoped, the Russian forces, which have been freed in Europe.

The accompanying map shows that the approach to Japan from Europe is via the enormous land mass of Eurasia, while the approach from the United States is across the enormous expanses of the Pacific Ocean.

If Russia joins in the attack on Japan, there will also be opened up the land

(*Continued on page 140*)

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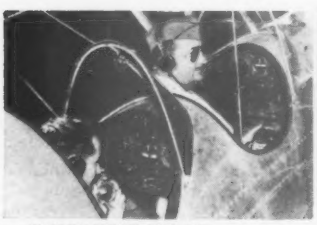

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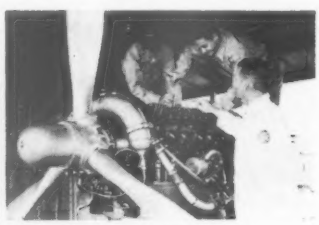

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THE "Vick's Vapor", a U. S. Army B24 Liberator, was returning from a successful reconnaissance raid on the Celebes. As there was plenty of ammunition left, with the crew still full of fight, it seemed a happy idea to drop down and pay a little strafing visit to a Jap-held village en route. That bit of military etiquette nicely attended to, they spotted a strange aircraft scurrying below them.

It was an old American DC3 type transport plane. Now it was being used by the Japs. A quick burst tore into the enemy ship and as it plunged down in flames, another bull's-eye was scored, this time with a camera gun.

The "Vick's Vapor" had indeed hit the jack-pot—it was learned later that the DC3 had been crowded with high ranking Jap officers.

The "Vick's Vapor and the 10 Cough Drops", with over 40 aerial sorties to its credit, was so named in honor of its co-pilot. Before he enlisted, Joe . . . * was a quiet, industrious young chap working in the Detroit factory branch of the Thompson Products replacement division.

Destiny plays queer pranks. At the very time Joe was busy, concerned only with Thompson valves, pistons and other automotive replacement parts, with never an ill thought toward the "clever little Japanese people", on the other side of the world an arrogant group of militarists were leaping, posturing and brandishing sabers in the Japanese sword dance and shouting brags of what they were going to do to the soft Americans.

Fate arranged the meeting in the far-off skies of the South Pacific. The result of this one small action is symbolic of how this vast conflict must eventually end. Surprised warlords will go down in defeat, never understanding how a democratic, non-militaristic nation like ours can send forth millions of fighting men of the calibre of the G.I. Joes in Normandy and the Joe . . . s* of the Pacific.

*Name and rank withheld at this time in consideration of Army regulations. This officer has been awarded the Distinguished Flying Cross and the Air Medal with Oak Leaf Cluster.

From actual official photograph made by crew of the U. S. Liberator which shot down this Jap transport plane.

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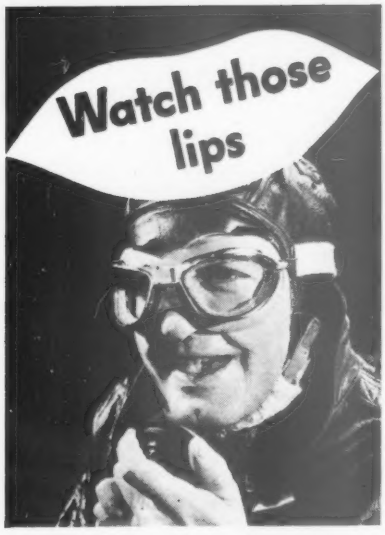

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(*Continued from page* 136)

route via Alaska into Eastern Siberia.

It is true that the Western Pacific is full of islands which can be used as bases for land planes to attack Japan. But to capture these islands we must use ship-based aviation. In addition, each of these islands can only furnish a base for a limited number of land planes.

The idea that Japan can be forced to surrender by destroying Tokyo and perhaps Kobe and a few other places does not seem possible to anyone who knows the Japanese. Tokyo and Yokohama were virtually destroyed, with a huge loss of life, by an earthquake some years ago. When this writer revisited Japan on his sixth or seventh trip there he found that this loss had not bothered the Japanese at all. They had buried the dead so carelessly that in some sections of Toyko on a hot summer's day the unmistakable smell of dead human beings assailed the nostrils. Probably in all of Japan there are not as many modern buildings as in those remarkably modern cities of Tulsa and Oklahoma City. The great mass of buildings are of flimsy wood and paper construction, easily destroyed—and as easily rebuilt.

There can be little doubt that Japan can only be defeated by decisively beating her armed forces.

The chief problem in the use of aviation against Japan is to get the large aviation forces now operating in Europe to land bases in Eastern Asia where they can be used to furnish maximum support to both land and sea forces in the attack on and destruction of Japan's armed forces on land, sea and air.

Since we rebuilt the fleet which we gave away for nothing at the Washington Arms Conference in 1921 and 1922, we have been persistently preparing the way for the attack by sea- and air-based aviation on the homeland of Japan. This is the heart of the Japanese empire. Once it is captured everything else will fall. Nipping off its outer edges in Malaysia, Burma and China will consume a great deal of time and the expenditure of many lives and much treasure to produce an indecisive result.

The land-based planes in Europe can be flown to India or China, or if Russia joins in the war against Japan, to Siberia. The existing air bases en route to these three places are not sufficiently numerous nor large enough to handle quickly the thousands of planes now fighting in Europe. Therefore, to take the fullest advantage of the strategic flexibility of aviation, the areas for the land bases should be decided upon now and the necessary air fields built. The necessary fields en route to these regions, so that thousands of planes can fly quickly to Eastern Asia, should also be built.

A glance at the map shows that India is too far off for a base for landplanes in any attack on Japan proper. The part of China held by Chiang Kai-shek is too isolated by mountains to bring in easily the tremendous amount of material needed to establish the necessary bases for such large aviation forces.

The map also shows that across Russia to that part of Siberia nearest to Japan is the shortest route for this large number of planes. Russia already has numerous bases in Eastern Siberia. She has the Trans-Siberian Railway and the more recently-built northern branch well to the north of the Amur River as a supply line. Russia, therefore, occupies a key position.

Two news items appearing about the same time furnish an example of the technical flexibility of aviation. One of these was the attack of the *Superfortresses* upon Japan. The other, unnoticed by most people but equally important, was the great success in Sicily and Italy, and later in France, of the little "grasshopper" planes manned by artillerymen and under artillery command, used to regulate artillery fire.

These two types, about as far apart as it is possible to imagine planes could be and still fly, furnish an excellent example of what can be done when the problems of war are faced realistically and planes are designed to meet these problems rather than to meet some maximum technical goal established by technicians unacquainted with war. The latter procedure results in some wonderful technical products but they are not designed specifically to do particular specialized jobs. And the result of such planes is always an effort to twist war to suit the best performance of the planes whatever the actual combat problems may be.

Aircraft can solve many war problems if they are designed to solve them. The point of view should not be "flying to fly" but "flying to win."

One of this writer's French friends is M. Dewoitine, the airplane manufacturer. He was very much interested in what I had seen in the Spanish Civil War, including a German airplane with a cannon. After the present war had been under way for several months I visited Dewoitine at Toulouse, where his factories were. By this time he had under development a number of different types of planes with cannon in them—each type designed for a different war situation.

He and his designers agreed that French aviation suffered from the fact that aviation technicians had had their way in designing the best types of planes to fly, whereas military aviation needed instead to first study the different problems which must be faced in war and then design different types of planes to meet each of these problems.

General Arnold has recently pointed out that, with the *Superfortresses* in action, *Fortresses* and *Liberators* could now be utilized as medium bombers, while the *Mitchells* and *Marauders*, now thought of as medium bombers, could operate against short-range objectives. Such a diversion of aircraft from one set type of operation to multiple assignments will contribute much to the flexibility of our air power, but it is not the final answer to the problem.

Between the *Superfortress* and the grasshopper plane there is a wide field of design open for different types of aircraft. When they are designed, the flexibility of design will give combat aviation increased flexibility and it should be possible to provide an answer in the air to every war problem on land and at sea. END

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Report from Washington

(*Continued from page 50*)

time, and controlling the traffic is accomplished with a minimum of mishaps . . . When Army *Flying Fortresses* first began large-scale daylight raids on Europe, pilots found it difficult to "formate" squadrons and groups over their home bases before starting out across the Channel. That is why, today, when you see the picture of a bomber in that area, you will note large letters and numbers printed on both sides of the ship's vertical fin. The letters are group and squadron letters. The numbers signify the year of manufacture and the serial number of the plane. This applies to *Fortresses* only. Medium and light bombers, *Havocs*, *Mitchells* and *Marauders* do not use letters. Instead, they paint their tails with distinctive markings, such as a broad band of red or a huge white triangle. One group has alternating squares of red and white . . . Signal colors are also assigned, differing with each raid. Using a Very pistol, pilots in lead planes fire these signal flares to help assemble their respective broods.

Briefings

Aviation Writers Association, Washington branch, is organizing a flying club. Navy's Leon Schloss, of NACA fame, is the prime mover . . . The Rockefeller Committee has requested CAA to do a movie on air training of South American students. Joseph S. McCoy, Jr., chief of CAA's visual information section, already has the work underway. The picture will be in color, a two-reeler, starring the Spartan School of Aeronautics, Tulsa, Okla., where South Americans are trained to be aviation mechanics; Purdue University, training center for flight instruction, and the CAA regional office, focal point for training Latin Americans in communications and air traffic control . . . Strangest thing about a couple of North American Aviation *Mustang* records recognized officially by the National Aeronautics Association here the other day is that, while both planes took off within a minute of each other and flew the same route, the one which stopped to refuel beat its nonstop rival by eight minutes in a flight from the west to the east coast. Col. C. A. Peterson, USAAF, who refueled at Kansas City, flew from Los Angeles to LaGuardia Field, New York, in 6 hrs. 31 min. 30 sec. Lieut. Col. Jack Carter, non-stop over the same route, checked in at 6 hrs. 39 min. 30 sec. The pay-off—Peterson's average speed was 378.544 m.p.h., Carter's 370.062 . . . The official recognition of the records came at the first meeting of the NAA contest board since the war began . . . Admitting they could not have made better time themselves (it says here in a press agent release), an army of 10,000 honey bees recently made a combined rail and air express trip from Redding, Cal., to Fairbanks, Alaska. Flight part of the trip was from Seattle . . . Air travel between the Americas this year will be 19 per cent ahead of last, air express up 57 per cent, says Pan American. The estimate is based on traffic the first five months of 1944.—Fred Hamlin.

Rescue by Radio

(*Continued from page 28*)

equipment and take bearings in similar manner to the Adcocks, except that they operate "close-in" within small areas. Equipment includes a Hallicrafters SX-28 receiver and a Telecord wax cylinder machine. The latter is used when a permanent record of any transmission is desired, such as in locating a clandestine radio station. When mobile units are necessary, several may converge on the area under observation.

Adcock direction finders are found at all of the 12 primary stations located throughout the United States, its territories and possessions. In addition, there are 32 secondary monitoring stations. These satellites operate in conjunction with primary stations within their area. All primary and secondary stations are linked together for instantaneous communications by private tieline or by radio links. Each primary station, for example, is equipped with several radio transmitters which may be used to communicate with other stations or Intelligence Centers should the teletypewriter tieline fail. These are ready for duty at a moment's notice.

Too much credit cannot be given the operating personnel of the RID. Seventy per cent are, or have been, licensed radio amateurs or "Hams." Operators patrol the ether 24 hours daily year after year. They copy signals which the ordinary person could not even hear. Their receivers are never turned off and they work in regular shifts. They scan the ether on all frequencies as a daily routine. They know every licensed station throughout the world and are able to spot a "hot one" in a hurry. The very existence of the RID is due to the efforts of George Sterling, chief of FCC's Radio Intelligence Division and himself a prominent radio amateur holding the call letters W3DF.

In the first few days after the Pearl Harbor attack, RID participated in the rescue of at least 12 planes. The service was especially valuable in the case of Army bombers on patrol flights. Lost Navy amphibian bombers, in contrast, could sit down on the ocean when they ran out of gas, call for help, and wait in comparative safety for relief.

Here is an actual case which speaks for the efficacy of the system:

At 9:23 p.m., October 23, 1942, the FCC radio security center at Honolulu was advised by the Seventh Army Air Force that a bomber en route to the mainland had encountered a storm. The plane headed back for the islands but its gyro

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Miss Jeane Callahan graduated from the School of Meteorology, Spartan School of Aeronautics in January, 1943. Employed to teach weather map drawing and observation at Spartan upon graduation. Later accepted position with the Hydro-Meteorological Division of the Weather Bureau at Washington, D. C., doing research work for the United States Engineers. Now Junior Meteorologist with Pennsylvania-Central Airlines, and soon to be assigned to regular forecasting duties.

Spartan School of Aeronautics, of which Miss Jeane Callahan is a graduate, is one of the most famous and highly regarded schools of its kind in the world. Spartan graduates are now applying their expert knowledge of aviation on every continent—and from practically every part of the world men and women are enrolling at this University of Aviation.

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instruments had failed and one of its engines was disabled. The pilot reported he was lost and asked what course he should fly to bring his crippled craft home safely.

The six RID direction-finders on the islands took bearings which were supplemented by bearings from the west coast primary stations at Portland and Santa Ana. The plane was told what course to fly. But shortly afterwards the plane's radio "blacked out." The stations in Hawaii and the mainland kept every frequency covered in an effort to pick up the disabled craft. It wasn't until after midnight that the plane came on the air again—and was spotted immediately and almost simultaneously by the six Hawaiian stations. They took more bearings and instructed the pilot to fly a certain course. Gradually the meter on the receiver at the FCC radio security center, which measures the strength of the plane's signals, climbed higher and higher. This indicated the plane was getting closer.

We quote the pilot's conversation as he approached the islands:

"I believe I see the searchlights . . . Yes, I see a large cluster of lights directly ahead of me . . . It looks like a small village . . . We are at 12,000 feet and beginning to let down . . . It is perfectly clear ahead of us . . . I see the lights on Diamond Head . . . I see the city of Honolulu . . . !"

Five minutes later the plane landed safely.

The system was so successful in the Hawaiian-West Coast area that within a few months it was adopted in other areas.

A system incorporating procedures similar to those used in Hawaii was adopted and placed in effect immediately on the east coast. So well did it work that in October, 1942, the First Bomber Command advised that the private tieline circuit between its offices and the RID was so "helpful to them in their work" that they "would not under any condition consent to its removal."

The following month headquarters of the Army Air Forces requested that steps be taken with a view to making the direction-finding services available in all of the various commands of the Army Air Forces throughout the United States. This was done immediately. The FCC pamphlet incorporating the uniform procedure was distributed widely in the Army Air Forces pursuant to an Army directive. The various Air Force Commands subsequently circulated further directives to their units, listing locations and telephone numbers of the nearest FCC stations and summarizing procedures to be followed.

One case involving a Navy plane occurred April 9, 1943, while RID monitors cruised the spectrum seeking illegal transmissions. Suddenly, they picked up this urgent call:

"SOS, SOS, SOS . . . Landing at sea southwest of island. Wind 25 from west Sea moderate."

The Anti-submarine Command was notified immediately on the private tieline. It replied:

"We have checked with our controllers and they are unable to identify the call on that. However, if you are able to get a fix we would like to have it."

Three minutes later the Anti-submarine Command was advised that the plane in distress "is very possibly Navy aircraft."

Ten FCC stations took bearings. They gave a fix 250 miles east by north of Bermuda—the island referred to in the SOS—rather than "southwest of the island" as the distressed plane had thought its position to be. The Anti-submarine Command later reported:

"The fix you gave us on the plane in distress was a very good fix. It was a PBY plane [*Catalina*] out of Bermuda."

The plane was refueled and reached its base safely.

No less important than its plane-saving role is the life-saving function of the RID.

On February 6, 1943, the agency's secondary station at Searsport, Me., notified the Eastern Intelligence Center that it had received from the Army at Presque Isle, Me., a telephone call stating that an Army plane had made a forced landing at an unknown location. Search planes were sent out. RID was requested to track the course of their flight continuously. The instructions were that if one of the search planes located the lost plane it was to circle over it and transmit so RID could obtain an accurate fix. That was precisely the way it worked out. The lost plane was found on a frozen lake. All hands were rescued, and the searching party even succeeded in reclaiming the disabled aircraft.

In the field of saving human lives, no function performed by RID has been more important than the aid it has provided in rescuing shipwrecked merchant seamen.

One of a number of such actual cases of RID assistance occurred on January 3, 1943. An Army lieutenant was returning to his base from a routine patrol. Some distance off the coast he spotted a lifeboat carrying 31 survivors from a sunken freighter. His fuel supply running low and his plane not suited for rescue, the lieutenant circled the lifeboat and advised the First Bomber Command of the situation by radio.

It was necessary that the exact position of the lifeboat be established so another plane could locate it and make the rescue. Accordingly, the Bomber Command asked RID to furnish a bearing as the plane transmitted "MO" signals. A fix was obtained in this manner. Another plane was sent out and subsequently located a freighter which was directed to the scene and rescued the 31 men.

The RID system is destined to play an important role in peacetime commercial flying. Procedures for co-operation between the FCC and the Civil Aeronautics Administration in locating commercial and private aircraft already have been formalized, in much the same manner as with the military.

From its humble and incidental beginnings, RID's direction-finding system for locating lost aircraft has become a vital part of military and commercial aviation. This $8,000,000 system has paid for itself many times over in planes brought home safely—more than 600. And in terms of human lives saved its value can never be measured. END

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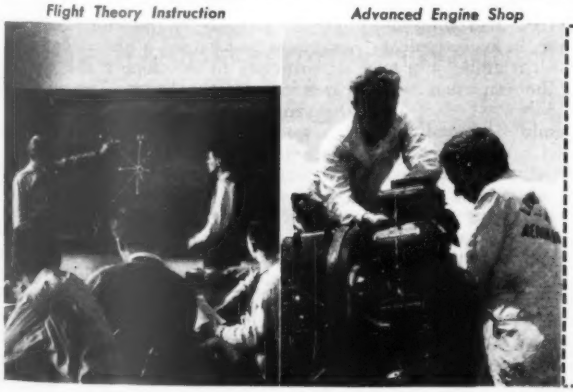

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Flying the Airacomet

(*Continued from page 29*)

sudden, but constant and cumulative.

As I taxied the plane I was impressed with the lack of dials and gauges, which usually require several minutes of checking prior to take-off. There were no oil temperature gauges, no cylinder head temperature gauges, no manifold pressure gauges. There were no mixture controls, no propeller control. I placed my hand on the dashboard and it was cold and still as death, so smoothly did the engines run. I turned on the dash vibrator.

By habit formed during years of flying, I attempted to steer the plane down the runway with the rudder, but of course found I was fanning dead air. Since there are no propellers there is no rush of air back against the tail. The only air blasts are from the jets, which blow under the rudder. So I had to steer with the brakes. The two rear wheels of the tricycle landing gear are separately braked. I would suggest a steerable nose wheel to overcome this problem.

I spun around at the end of the runway preparatory to taking off. The time consumed in engine warmup is saved, for the jet units are ready for flight almost instantaneously. The turbines made a slight whirring sound, while a low and distant rumble, like the sound of a far-off train, came from the jets. There was nothing to do but radio the control tower that I was ready for the take-off.

I took off at the usual speed and in about the same distance required with any plane of its size, but I must admit I had the feeling I wouldn't leave the ground, for there was none of the usual surge of engine power.

I was in the air now, climbing steadily. The higher I soared, the less throttle was needed to maintain speed. At high altitude, true fuel economy comes into its own. Flying at high altitudes will effect a most substantial fuel saving—a vital consideration in wartime aviation. In a reciprocating engine, power must be increased eight-fold to double the speed of the plane.

Otherwise, the *Airacomet* behaved conventionally in the air. There was no torque to the right or left. The ship was so smooth I felt I was moving at a snail's pace. I sensed no power, yet at my fingertips was more power than I had ever known before. To a man who has flown thousands of hours in every type of plane, from the smallest training ship to the largest bomber, the sensation was almost weird.

Since it takes a couple of seconds for the jet units to speed up, landing the plane calls for somewhat greater caution. There is the danger of coming in too short without being able to lift the nose sharply at the touch of the throttles.

I stepped out of the plane and Captain Tucker greeted me with, "How do you like our Jet?"

"There's just nothing like it," I said. "I had the sensation that I was piloting a glider with a thousand phantom winds pushing me through space."

The German Messerschmitt Me-163 jet plane was thrown against Allied airmen during the Battle of France and its performance was respected. It is not likely, however, that the enemy will have jet planes as successful as ours.

Metallurgy in the United States has reached a high point of development, making it possible to prolong the life of certain elements operating at high temperatures in the *Airacomet's* power plant. And metallurgy is the enemy's short suit.

For a time, the short life of these elements, which must withstand terrific heat, presented a knotty problem.

Col. H. A. Boushey, commander of the first jet fighter group, who probably knows as much about jet-propulsion as anyone in the country, warned me, however, that we shouldn't expect miracles.

"The problems still remaining in perfecting the *Airacomet* are not impossible of solution," he declared. "But engineering developments take time and no new technique is going to revolutionize the aviation industry overnight. There is a great temptation to paint a glowing picture of the future of jet-propulsion. But the realities of the situation dictate the strictest kind of conservatism."

The colonel recalled that the rocket plane, forerunner of the *Airacomet*, was the object of experiments 100 years ago. "This is evidence enough," he said, "that scientific developments take time."

"For the present, I think we should forego the urge to speculate on the possibilities of jet-propelled passenger airliners, although there is no reason to believe that the jet principle will not prove successful in larger planes."

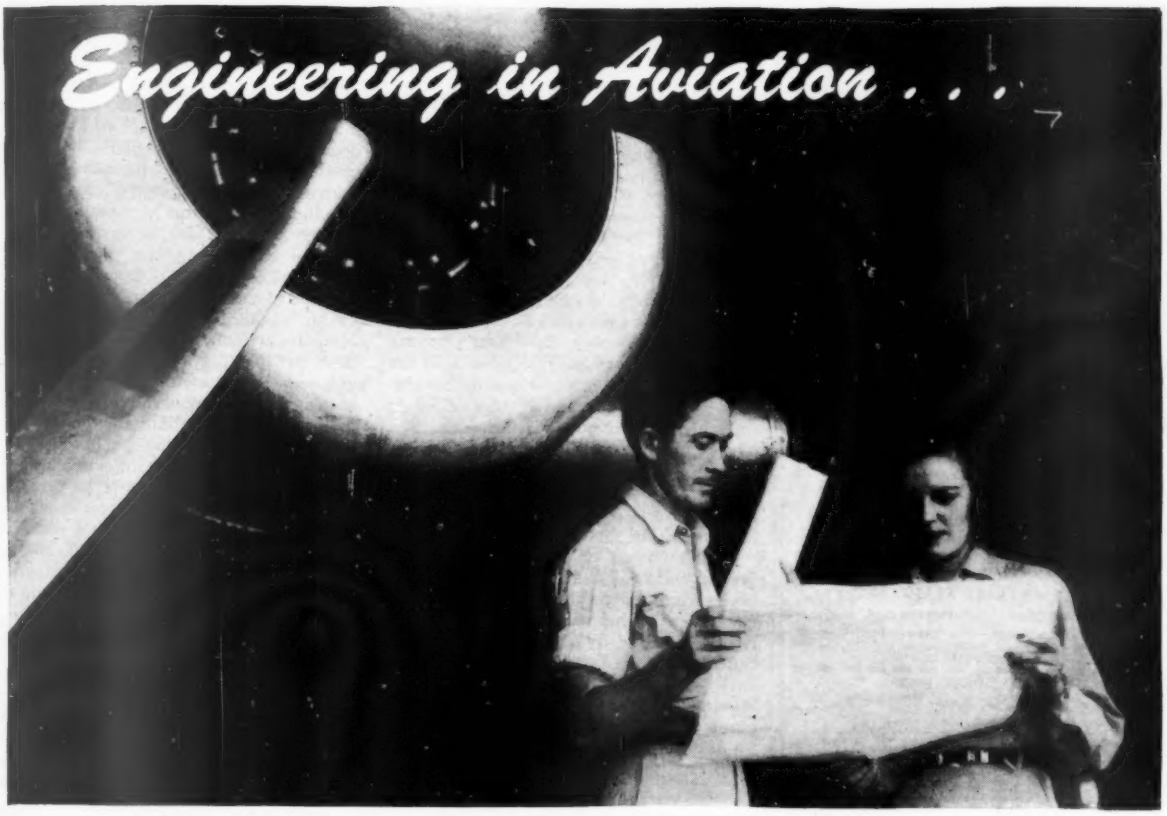
Five months before Pearl Harbor, Gen. H. H. Arnold learned of the Whittle engine and had it shipped to the United States in September, 1941. Research in jet-propulsion in the United States had been under way for some time prior to 1941 but no designs had gone beyond the experimental stages.

Group Captain Whittle had been working on his idea for years. After conferring with Group Captain Whittle, General Arnold and high British officers decided to build the unit for a jet plane in the United States based on Whittle's design.

The General Electric Company was chosen to construct the unit because its engineers had gained a knowledge of the jet principle in developing the turbosupercharger for the Army. The secrecy of the project precluded a call for bids on the work. The job of constructing the plane itself went to Bell Aircraft.

Appointed as liaison officer for the project was Brig. Gen. B. W. Chidlaw, now chief of the division of materiel, maintenance and distribution. Col. Don J. Keirn was given the job of engine project officer and Col. Ralph P. Swofford, Jr., was placed in charge of the airplane project. I know both men and have great respect for their aeronautical talents. For a full year these men worked untiringly.

The completed plane made its first



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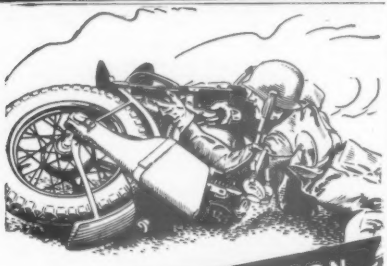

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Corporal Tommy D., who signs his letter "A Harley-Davidson Kid," really wrote this ad: "Every word you say about the Harley-Davidson is true. I know myself, for I have driven 11 months overseas and I put it where few machines could go. The Harley-Davidson I was driving sure got me out of a lot of tight holes. It fell right next to me—saved me from getting more holes than I have now. I'll be getting out of the hospital soon and will then have another one of your motorcycles."

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flight on October 1, 1942. Five months earlier, General Electric conducted the first test run on the jet unit. In September, 1942, at the remote desert station where testing still is under way, ground trials were run. An observer in a special open cockpit in front of the pilot took notes as the plane taxied back and forth along the runway.

A stalled take-off was made later. The Jet climbed to the dizzy altitude of one foot. On another take-off it doubled its climb. Trouble had developed with the left engine, and these tests were made with the right unit alone.

Robert M. Stanley, chief test pilot for Bell Aircraft, gunned his plane into the sky on October 1, 1942, attaining an altitude of 25 feet. He landed, took off again and this time zoomed to 100 feet. The Army officers who witnessed this demonstration were delighted. The next day, on October 2, their judgment was confirmed when two flights carried the craft to 6,000 feet and 10,000 feet, respectively.

Col. Lawrence Craigie, then chief of the aircraft project section, who has since been promoted to the rank of brigadier general, won the honor of being the first Army officer to fly the ship. Tests were continued at the desert station and a wide variety of gremlins was ferreted out. In moving the plane by truck from the Bell plant to the secret base, an interesting bit of deception was perpetrated. A mock propeller was tacked onto the plane's nose and covered with a tarpaulin to allay any suspicions that the plane was not a conventional model.

But some day soon the *Airacomet* will see action. Because of its speed and almost silent operation it will be more deadly than any fighter plane ever developed. In addition to its advantages in high altitude fighting, the plane should be excellent for strafing because its engines give so little warning of its approach.

After considering the possibilities of jet-propelled aircraft, I have come to the belief that a single-engined jet plane, with the turbo-thermal unit in the fuselage behind the cockpit, would be more efficient than the Bell corporation's present twin-engined job. It would fix a better center of gravity, reduce overall weight and fuel consumption, and eliminate the necessity for duplicating engine parts without a compensating doubling of power output.

The myriad advantages of jet-propelled planes are traceable to the one great quality of simplicity. A good pilot can learn to fly the plane in about 15 minutes. Youngsters who are just learning the business might master the ship in less than half the time required for other planes. And—what is most promising—men and women without the peculiar kind of mental agility needed to become pilots may gain new hope. Guiding a flying machine through space will be no tougher than riding a purple-eyed horse on the merry-go-round. END

Airline Jobs, Post-War

(*Continued from page 53*)

is operating a vast international system under contract to the Air Transport Command, in addition to its domestic routes. It is not likely that the world system of airways which has been built up by the Air Transport Command will be retained intact for American carriers after the war is over. However, international routes under American flag carriers will undoubtedly be expanded after the war, as will domestic routes. We believe that our company, for example, could operate profitably in commercial service the equivalent of the planes it has been operating for the Air Transport Command whether or not it is granted additional routes. Any such increase in route mileage and in the number of planes being operated will bring about a corresponding increase in the number of employees.

These increases will show up especially in the ground jobs—maintenance, fleet service, engineering, communications, etc. —much more than in the flying positions, for there are approximately 10 people on the ground for every one in the air. These ground jobs, many of which have been filled by women during the war, will probably revert in most cases to men. Before the war, women comprised between 17 and 18 per cent of American Airlines' total payroll. Most of them held clerical positions. At the present time the proportion is more nearly 35 per cent. Following the war, I expect it will be about 25 per cent, for in addition to clerical jobs, which will still be held predominantly by women, wartime exigencies have shown that women reservations- and ticket-counter clerks are generally equal to men. The proportion in this branch of the business will probably be about half men and half women, which will partially offset elimination of women in other branches of the industry.

Travel by air no longer has to be sold any more than travel by rail, by automobile, or by water. But there is still a big selling job to be done on air cargo. One of the fields in which ex-service men who have advanced to executive positions in the military services will find an outlet for their energies after the war will be in selling the benefits of air express in peacetime to companies and to individuals who are not yet accustomed to using this method of transportation. Additional personnel will also be needed in the operation of expanded air cargo departments.

The greater the volume of cargo, the lower the rates will be and this in turn will result in greater expansion of usage.

No one knows better than the boys themselves, too, what resources and what markets await development in far corners of the earth, for they know what can be brought out of distant and now undeveloped lands to enrich our own lives and industry. American Airlines, for example, has already started to bring these remote sections into the orbit of international trade through its operations in Mexico. Representatives of the company are deliberately searching out pro-

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The air transportation industry will be in very much the same position after this war as the automobile industry was in after the First World War. The commercial airlines are making specific plans for immediate expansion when the war is over along lines which they believe will be practical and economically sound. We in America at the same time are conscious of the sociological aspects of a world system of air transportation and are taking steps not only to improve the condition of our employees within the company itself but also to fit them to occupy positions of dignity and trust in their communities and in the world. If these plans are not hamstrung by politics or hampered by other industries which do not realize that they too will gain in the long run through the development of new markets, there should be many jobs for ex-service men in every department of the business. But I should like to repeat again what every man in the air service now knows, that, because of the nature of air transportation, more of these jobs will be on the ground than in the air. END

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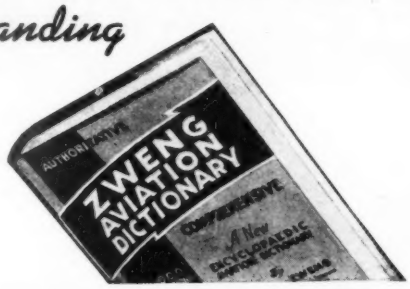

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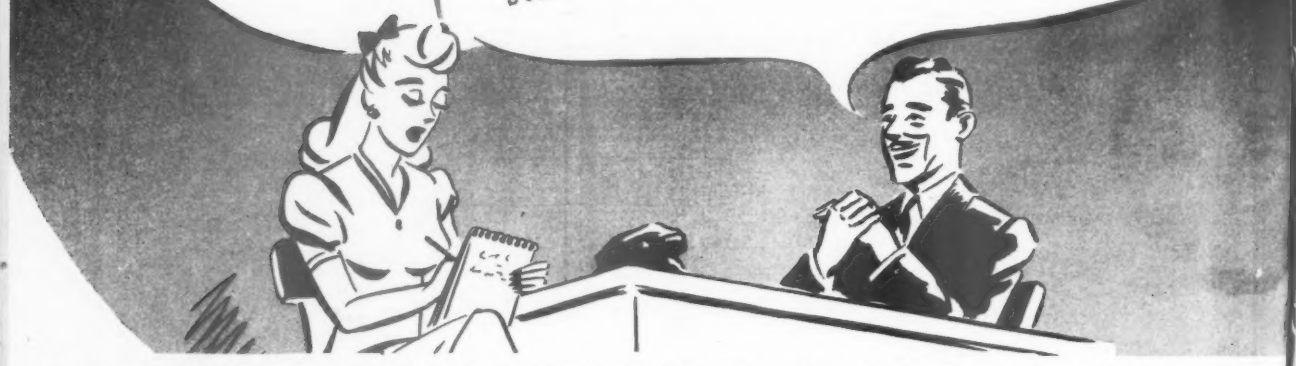

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